Mining CONGRESS JOURNAL

SEPT. 1957

DENVER SRL Rubber Lined Pumps

TAKE the punishment at La Luz Mines, Ltd.

6" x 6" DENVER SRL Pump Handles 2000 TPD for 9 to 12 Months —A total of 730,000 Tons Before Impellers and Liners are Changed!

La Luz Mines, Ltd., Nicaragua, installed a 6" x 6" DENVER SRL Pump in 1940 to handle 2000 TPD classifier overflow from three ball mills to distributor box ahead of flotation section. In 1941 they installed another 6" x 6" DENVER SRL Pump for a standby. Pumps are run alternately one week each so impeller and liner life will be even. By alternating the pumps, the runners and liners last from 18 to 24 months, or the equivalent of 9 to 12 months continuous service for each pump before replacement parts are necessary. Screen analysis of classifier overflow runs 36.6% +65 mesh.

In addition to these two pumps, La Luz Mines uses 10 3" x 3" DENVER SRL Pumps and two 5" x 4" DENVER SRL Pumps.

For complete details on how you can lower your abrasive pumping costs with dependable DENVER SRL Pumps, write for bulletin P9-B10 Pumps and parts in stock.

In Stock for Quick Delivery

"The firm that makes its friends happier, healthier and wealthier"

DECO ENG

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado

DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO

MEXICO, D. F. • LONDON • JOHANNESBURG

Mining

CONGRESS JOURNAL

SEPTEMBER, 1957

VOLUME 43 NUMBER 9

CONTENTS

FRONT COVER Mining conditions unlike any other found in the United States impose serious operating problems at the Viking mine of Viking Coal Corp. near Terre Haute, Ind. In an article beginning on page 38, Ray Biggs tells how these were overcome.

ARTICLES

DEPARTMENTS

Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign, $5.00. Single copies, $0.30. February Annual Review Issue, $1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.

Member Audit Bureau of Circulation

Indexed regularly by Engineering Index, Inc.

THE AMERICAN MINING CONGRESS
RING BLDG., WASHINGTON 6, D. C.

HOWARD I. YOUNG
President

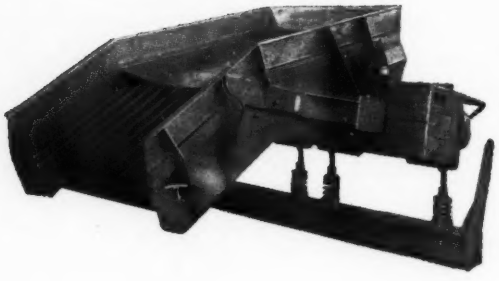
WORTHEN BRADLEY
Vice-President

ANDREW FLETCHER
Vice-President

RAYMOND E. SALVATI
Vice-President

JULIAN D. CONOVER
Exec. Vice-President and Secretary

make it JEFFREY.....



Grizzly Feeder

By-passes fines ahead of primary and secondary crushers, screens, picking belts. Safeguards belts by bedding them with fines, absorbing impact and preventing damage.

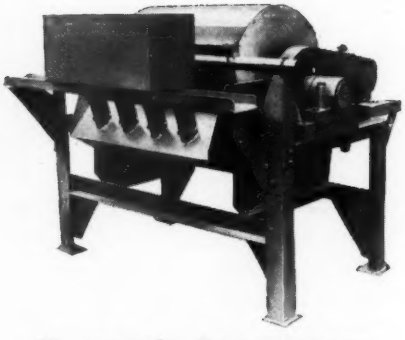
Vibrating Feeders

To meet all capacity requirements and for handling most classes of materials. Jeffrey feeders can be furnished with various styles of decks and in types to satisfy all operating conditions; dust-tight, spark-proof, etc.

for mining.....

Locomotives

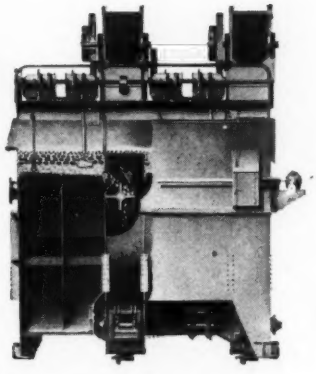
Sturdy, streamlined, easy to operate and maintain, Jeffrey locomotives are known throughout the world for their reliability and long-term service. Available in trolley, cable reel and storage battery types, in sizes to suit your requirements.



Magnetic Separators

Solve wet concentration and magnetic recovery problems. Of the wet drum type, with only this one moving part, Jeffrey separators and cobbers are simple to operate. One supervisor can take care of a 70-unit plant. They're highly efficient.

and processing.....

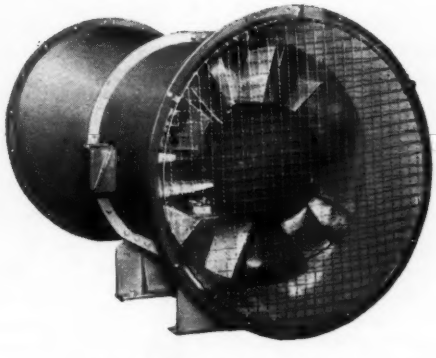


Baum Jigs

Ideal as a final concentrator or as a rougher ahead of flotation. Jeffrey air-operated jigs give exceptionally high capacity per unit of area, often ten times that of conventional plunger jigs. For years they've been handling some of the toughest separation jobs.

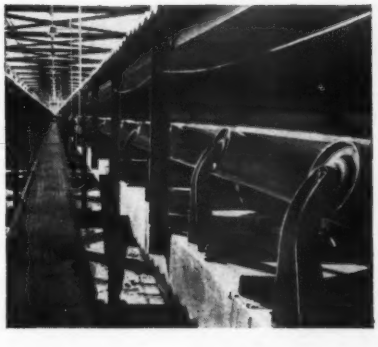
Rock Buster

A hard-hitting giant that's suitable for crushing large primary feed—everything that comes from the face, without preliminary sizing or picking. Also available from Jeffrey are other crushers in types and sizes to meet every sizing requirement.



Ventilating Fans

Jeffrey makes fans for every mining condition —midget blowers for auxiliaries, junior models for low pressure work, and mammoth multi-stage units for high pressure, high volume service. Jeffrey engineers assist in their selection.



Belt Conveyors

A few feet long or extending miles, underground or across country, belts run smoothly with Jeffrey equipment and drives. A complete range of sizes and capacities to meet all handling operations is available through Jeffrey.

MINING • CONVEYING • PROCESSING EQUIPMENT...
TRANSMISSION PRODUCTS...CONTRACT MANUFACTURING

Printed data on any of these Jeffrey products are available through our district offices or The Jeffrey Manufacturing Company, 974 North Fourth Street, Columbus 16, Ohio.

JEFFREY

Tournatractor handles at Festus, Mo. for Aubuchon Silica Mining Division of Portage-Manley Sand Co. Working in extremely abrasive sand, and across uneven hard rock floors, has been no problem and maintenance costs have been very low.

How Aubuchon keeps ahead of tight production schedules

. . . cuts costs on tractor maintenance

Pit shovel, to wash plant, to rail car — in an hour. That's a normal scheduling at Aubuchon Silica Mining Division, Festus, Mo. Owned by Portage-Manley Sand & Gravel Co., Rockton, Ill., the firm ships many carloads a week of fine silica used in foundry cores and crystal glass.

Aubuchon does no stockpiling, depends on steady production to fill orders. Extended downtime on any machine, therefore, could halt shipments. One of the major availability problems is that of the pit tractor. Servicing the stripping and clean-up operations over the entire pit and plant area, this machine must continuously cross rough, rocky areas . . . working in silica so fine and hard it's been described as "sharp as grinding compound".

"Tournatractor® only machine that can do our tractor work . . ."

Since 1952, Aubuchon Silica Mining's tractor jobs have been handled by a rubber-tired LeTourneau-Westinghouse Tournatractor. As Plant Manager Ira Kent says: "The abrasion, rough going, and back-and-forth travel is too rough for crawlers. Tournatractor is the *only* machine we've seen that can do our tractor work."

Tournatractor's main assignments at this pit are stripping overburden to expose new sandstone, and cleaning up around shovels. But its rubber-tired mounting, sealed anti-friction drive, speed and "go-anywhere" ability let it take on a full circuit of haul-road building and maintenance, stripping, shovel and general clean-up dozing at the pit, mill, and yards.

Maintenance now no problem

How has Tournatractor stood up under conditions so tough? Let Manager Kent tell it: "The last crawler we had was junk inside of 11 months. We've worked Tournatractor 45 hours a week for almost 5 years, *with no real trouble*. On our rough hard rock floors and with free silica sand all over, that's something!

"Our one and only major repair expense in all that time has been replacement of the torque-converter oil-seal and bearings. We've never done anything to the engine . . . never broke an axle, chipped a gear, or had a single major thing go wrong!"

Ask for a demonstration

Tournatractor has minimized maintenance problems for Aubuchon Silica Mining, while doing a lot of work quickly, efficiently. Investigate now what it can do at *your* pit. Let us send you full facts and arrange for an on-the-job demonstration. No obligation!

Tournatractor has plenty of power to doze rocks too big for pit shovel. Big, rubber-tired machine also cleans up fast to let drilling crew set next charges earlier.

Stripping overburden, Tournatractor slot-dozes — using walls of slot as "natural sideboards". Method keeps dirt from spilling off edge of blade for bigger loads with same effort. "Fill-in" jobs like this keep Tournatractor busy the year 'round.

CT-1500-M-1

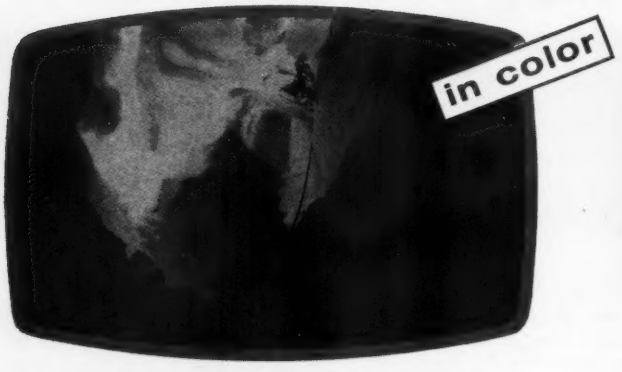
LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit.

SEE TIMKEN TELEVENTS ON NETWORK TV

Two big hour-long spectaculars this fall



Over 126 NBC STATIONS, SEPTEMBER 23rd

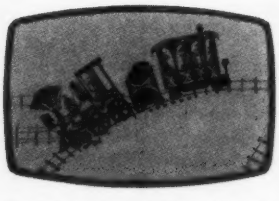
"Eleven Against the Ice", the story of the Antarctica Turnpike. See men and machines build a trail across Antarctica's frozen wastes—in spite of 200 mph winds, temperatures of 120 degrees below zero and crevasses big enough to swallow a 20-story building. It's a triumph of engineering and human courage, a whale of a television show.

Over 142 NBC STATIONS, NOVEMBER 21st

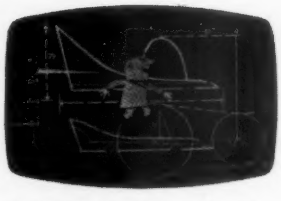
"The Innocent Years". Recaptured from exciting old films and newsreels, you'll see happy days relived. Experience the excitement of "Teddy" Roosevelt, Thomas Edison and Mark Twain in action. Hear songs like: "In the Good Old Summertime", "He'd Have to Get Out and Get Under". Enjoy the fun of family picnics, the joys of people in the last untroubled time in our history.

And commercials that help you sell . . .

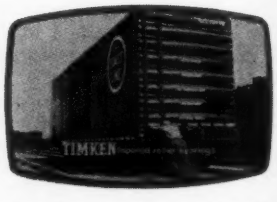
See How man stumbled on the concept of the wheel.



See Why America's railroads have always led the world.



See Why Americans jump for the latest thing in cars.



See One man push a freight car all by himself.

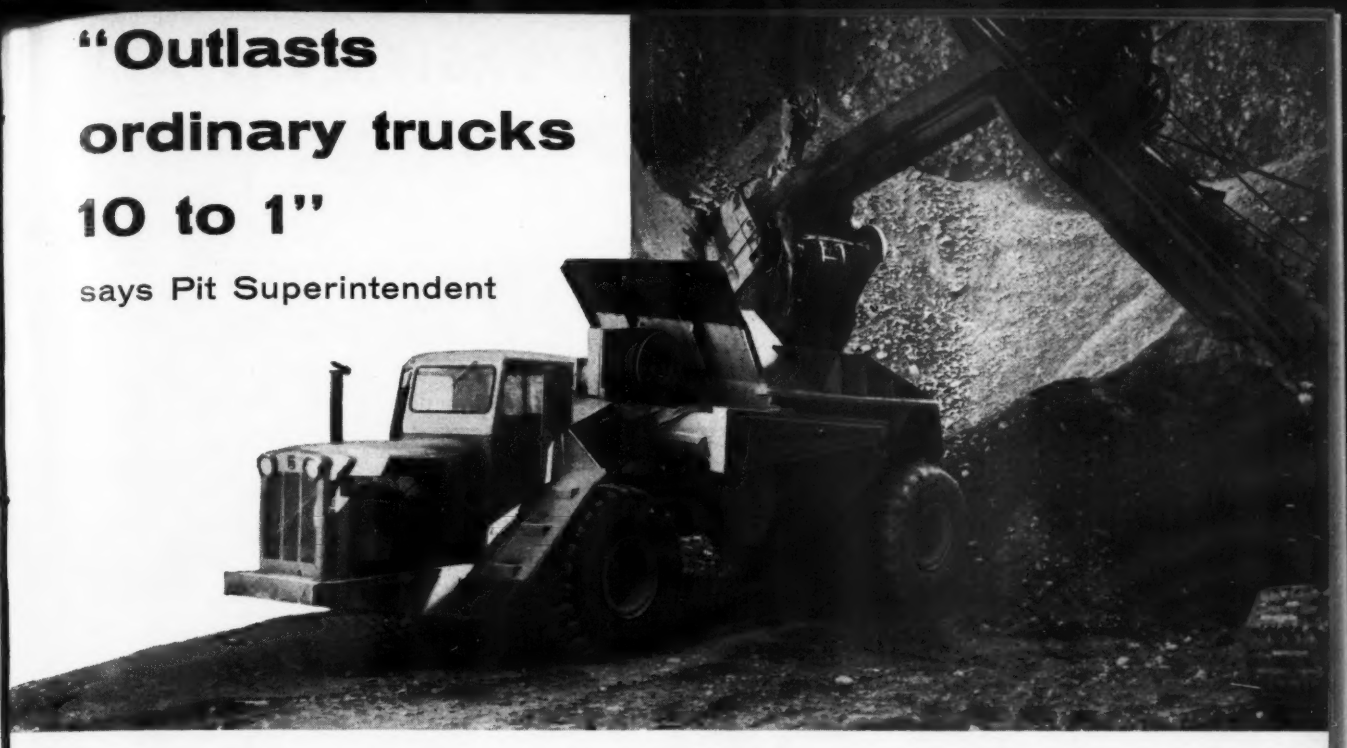
Years of national and trade advertising, backed by their superior performance, have made "Timken" the best-known name in bearings—a name that helps to sell the products that use Timken® bearings. Now, network television will build even a greater awareness of Timken bearings—make them an even bigger sales plus in the equipment you sell. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN TAPERED ROLLER BEARINGS

TRADE-MARK REG. U. S. PAT. OFF.

"Outlasts ordinary trucks 10 to 1"

says Pit Superintendent



Shovel operator quickly loads C Tournapull Rear-Dump with 19 tons of bank gravel. Low rear entry of bowl permits easy swing-out of empty dipper — even without closing door.

L-W hauler dumps load of gravel and rock into grizzly. With electric hoist, bowl can be lifted for full, instant dump, or controlled at a reduced angle for slow, precision feeding.

After 29 years of continuous digging in the same pit area, pit still produces 3600 tons of "pay dirt" per 12-hr. day. The last nine years, pit has been operated by Valley Sand and Gravel Co., Waukesha County, Wis. Valley's hillside excavation runs about 80′ deep. Company officials estimate it will be excavated at least another 30′ before digging operation is relocated to a new pit area.

Two LeTourneau-Westinghouse Rear-Dumps — one 22-ton model "C", and one 11-ton "D" — are setting a fast production pace by handling all hauls from pit to grizzly. Company uses another L-W Rear-Dump for hauling processed materials to stockpiles.

Haul heaping loads up 10% grade

In typical performance, C Tournapull® Rear-Dumps are loaded with 5 passes of 2½-yd. shovel — getting about 12½ bank yds. (19 tons). Three passes load the "D" with 7½ yds. (12 tons). Rear-Dumps haul 1100′ from pit floor . . . up a 10% grade . . . to grizzly. Except for delays at grizzly, each machine makes 9-10 trips per hour. Combined production of the 2 units averages 200 yds. (300 tons) per hour . . . 3600 tons per day.

"A good machine . . . gives no trouble," says operator

Until 1952, Valley Sand and Gravel Co. used ordinary trucks for their rough pit haul work. Each year they experienced heavy maintenance expenditures, amounting to thousands of dollars. In 1952 . . . in an effort to step-up pit production and cut maintenance expense . . . they purchased 2 L-W Rear-Dumps. These rugged off-road haulers proved so successful, they now operate 3 of them.

Superintendent Carl Darrow says, "Tournapull Rear-Dumps outlast ordinary haul trucks 10 to 1. Most truck bodies are too thin. Our work is also too hard on truck tires, transmissions, differentials, axles, springs and drive shafts."

Jim Schmeichen, operator of C Rear-Dump, comments, "It's a good machine . . . does the work, and gives us no trouble. You don't have to worry about breaking a spring."

Get facts for your type work

Check all the facts and figures available from other Tournapull hauler owners, for work like yours. See how these Rear-Dumps can give you more production at far less cost. L-W Tournapull Rear-Dumps are available in three sizes: 11, 22, 35 tons.

DRCR-1338-Q-b

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

WHERE QUALITY IS A HABIT

LIGHTER IN WEIGHT . . . EASIER ON AIR

IR 75-LB STOPEHAMER

saves time, effort and air on all up-hole drilling jobs

R-38A

. . . designed to take full advantage of longer-lasting, faster-drilling CARSET JACKBITS

The exceptionally light-weight and well-balanced design of the Ingersoll-Rand R-38A Stopehamer pays off in increased production. It not only weighs up to *26% less* than older-type stopers, but also uses *25% less compressed air.*

Built to stay underground this powerful, light-weight drill has automatic rotation, self-cleaning chuck, graduated throttle for easy collaring and protected exhaust ports. Ask your I-R representative for complete information on the cost-cutting R-38 Stopehamer.

Ingersoll-Rand

5-565

11 Broadway, New York 4, N. Y.

DRIFTERS • JACKDRILLS • JACKHAMERS • CRAWL-IR DRILLS • CARSET BITS • AIR TOOLS • COMPRESSORS

100% anti-friction drive

gives you bonus push-power... top efficiency

This Adams 550 boosts pit production... keeps haul-roads smoother... carves-out new roads easier... opens snow-clogged routes earlier, than ordinary graders of similar size and power. It cleans-up around pit and plant fast... maintains better drainage. At every speed, Adams transmission, final-drive, and tandems deliver maximum engine-power to wheels, because all gears and shafts turn on ball- and roller-bearings. Control clutches, shafts and linkage also on anti-friction bearings.

Compared to other graders, Adams heavy-duty machines deliver a greater proportion of developed engine-power to tandem wheels. An Adams gives you this bonus work-power because all gears and shafts in transmission, final drive, and tandems turn on anti-friction bearings.

Push bigger loads... faster

Because the Adams' drive has roller- and ball-bearings throughout, very little of its horsepower is lost thru friction. More thrust is made available for pushing bigger loads... for blading deeper... for working faster. Furthermore, with an anti-friction drive, your graders' fuel-cost per unit of work done is correspondingly lower. Finally, longer bearing life cuts maintenance expense and downtime for repairs.

Transmission delivers maximum torque

The Adams transmission provides more power-speed combinations than other graders... 15 speeds... so you can do every grading operation at fastest practical rate. At each speed, transmission delivers maximum torque, because all gears and shafts turn on anti-friction bearings. It is fully constant-mesh... gears always engaged for fast, easy gear-shifts without clashing. Crown-shaved helical gears mate precisely... run continuously in oil... do not "howl"... give extra-long life.

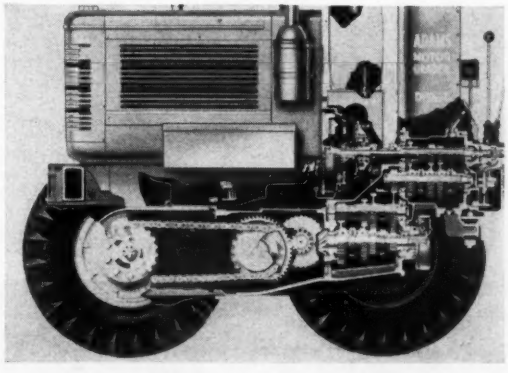
Rear-Axle carries no weight

In heavy-duty Adams graders, 80 to 190 hp, the main rear axles are full-floating — they do *not* carry weight of the grader. Instead, rear-end weight is borne by sturdy axle carriers, consisting of two concentric, tubular-shaped, steel housings — one inside the other. Tandems oscillate at will on the two axle carriers. Grader keeps all four tandem wheels on the ground, even in roughest terrain... driving, pushing, working all-the-time.

Inside the axle-carriers, driving-axles float "free", mounted in anti-friction bearings. They are fully protected from abnormal shocks and stresses of rough terrain... secure against breakage and undue wear.

All gears and shafts in the Adams transmission turn on ball-, needle-, roller-, and tapered-roller-bearings.

Main rear axles are mounted on anti-friction bearings, and carry no grader weight. Instead, rear-end weight is supported on concentric, tubular axle carriers. Inner axle carriers are bolted to tandems; outer carriers to final drive housing. Thus, tandems can oscillate freely — without putting stress on main axles. 100% anti-friction drive increases available work-power, reduces operating costs.



Ask for demonstration

See how Adams' 15* speeds, with power delivered thru 100% anti-friction drive, give these machines *bonus* push-power... a capacity for work no other grader can match. Let us explain how an Adams saves you money on fuel and repairs... how it can keep producing for you week-in and week-out. 6 models, 60 to 190 hp. Choice of General Motors or Cummins diesel engines on 5 larger models. Call or write for all the facts.

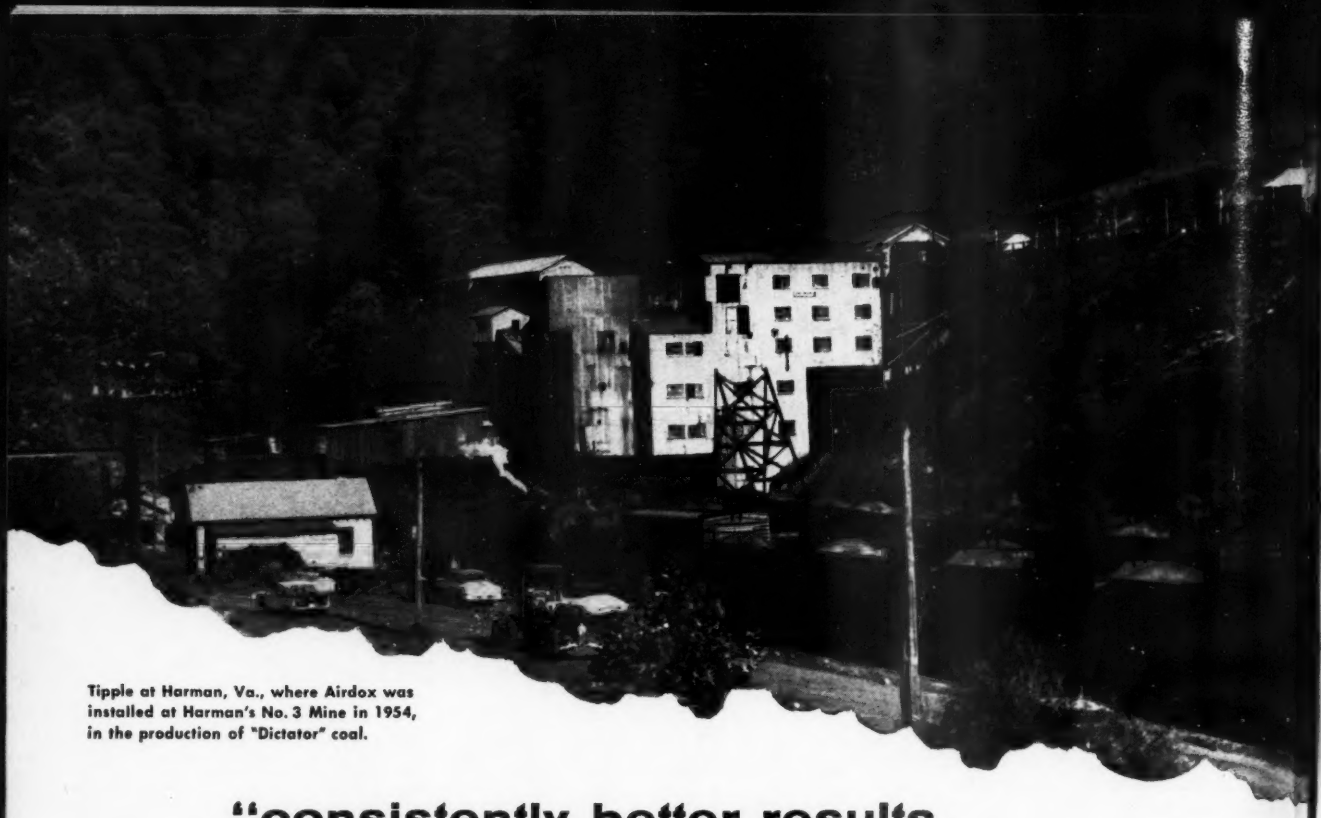
**190 hp* POWER-*Flow 660 provides infinite number of power-speed combinations (to 27.4 mph) thru torque converter. 60 hp Model 220 has 9 speeds forward, with optional creeper gears... best in its class.*

Adams, POWER-Flow—Trademark AG-1231-M-b

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



Tipple at Harman, Va., where Airdox was installed at Harman's No. 3 Mine in 1954, in the production of "Dictator" coal.

"consistently better results with AIRDOX"

NON-EXPLOSIVE MINING METHOD

AIRDOX

NON-EXPLOSIVE MINING METHOD

Cuts Costs 5 Ways

- Produces less fines in face preparation
- Rolls coal forward for faster, easier loading
- Easier on "tender" roofs—cuts timbering, bolting
- Lowers cleaning costs by minimizing fines
- Reduces degradation—no shattered coal

DICTATOR

says I. J. RICHARDSON,
President,
Harman Mining Corporation

"Cardox Corporation installed their Airdox System in our No. 3 mine in 1954. We find that we are getting consistently better results with Airdox, inasmuch as the coal produced from this mine contains a larger percentage of coarse coal and the loadability is much better when loaded mechanically. Airdox is economical, too, on a cost-per-ton basis.

"The management of this mine is well pleased with the performance of Airdox and results obtained."

how to get the most out of HOLLOW DRILL RODS

Detachable carbide insert bits are a cost-cutting tool for the hard rock driller. But their use presents problems to the blacksmith. One problem is the premature failure of the attachment on the drill rod. When that happens, time is wasted in trying to recover the bit and, often, valuable bits are lost.

But, with new alloy steels such as Crucible CA DOUBLE DIAMOND or 4E, plus careful control of operations in the forge shop, you can keep failures to a practical minimum.

For example, prevent SCALING OF THREADED SECTION

Excess scaling may produce undersize threads, loose fitting bits and ultimate mechanical failure of the drill rod due to poor stress distribution. Here are a few precautions to take to prevent excess scaling:

TIME AND TEMPERATURE—

Of primary importance are the time and temperature which the heat-treater selects for the job. Although they will vary somewhat with the composition of the steel and the size of the rod, time and temperatures should be selected which are the minimum at which the desired result can be obtained. Excess furnace time or temperature will result in excessive scale formation.

FURNACE ATMOSPHERE – Avoid a highly oxidizing flame. The higher the excess oxygen content, the greater the tendency for scale and decarburization to form. And a reducing flame leads to carburizing brittle threads. The furnace best operates with a "soft" smoky flame or under near neutral conditions.

SCALE REMOVAL—

Scale is abrasive, and unless what scale does occur is removed, thread wear results. Wire brushing is a fast, convenient and safe method for removing scale.

Crucible hollow drill rods are tough, strong—made to tool steel standards. Their *extra* quality means less rod breakage—fewer valuable bits lost. So specify Crucible hollow drill rods for your next job. They're quickly available in the sizes, types and grades you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Make Big Stripper Bucket Loads BIGGER . . .
Swing A Bucyrus-Erie New-Design Bucket

A 14-cu. yd., medium-duty, new-design Bucyrus-Erie bucket is swung on the 215-ft. boom of a 650-B. Approximately 50 feet of overburden is being stripped to uncover a 6-ft. vein of coal.

Bucyrus-Erie new-design buckets *load fast.* Their weight is concentrated to help teeth, cutting edge and thin "slicing-action" lip penetrate swiftly. Material flows in easily because the basket is properly tapered. Buckets *carry smoothly* because they are properly flared and balanced to hold down bobbing and spillage. High arch and smooth inside design assure *clean dumping.*

Armored with BECOLOY

Equally important, use of BECOLOY gives buckets exceptional impact and shock resistance as well as hardness to resist wear. Exclusive with Bucyrus-Erie, BECOLOY has a tough fibrous structure, is readily cut with an acetylene torch and welded without special procedures.

A new-design Bucyrus-Erie bucket can help you improve the efficiency of your stripping operation. You can choose from a wide range of sizes . . . for light, medium or heavy duty . . . with solid or perforated baskets. Your Bucyrus-Erie distributor will gladly make recommendations that can make your big stripper bucket loads *bigger.* 26R57C

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

EXPLOSIVES RESEARCH PAYS OFF

Excellent breakage of iron ore from primary blasts assures speedy, economical loading operations.

An uninterrupted cycle of production in a mine begins with the selection and use of the right explosives and blasting method.

A continuous research and development program at Hercules makes explosives available for all kinds and conditions of work . . . in mines and quarries, on heavy-construction jobs, on seismic exploration projects.

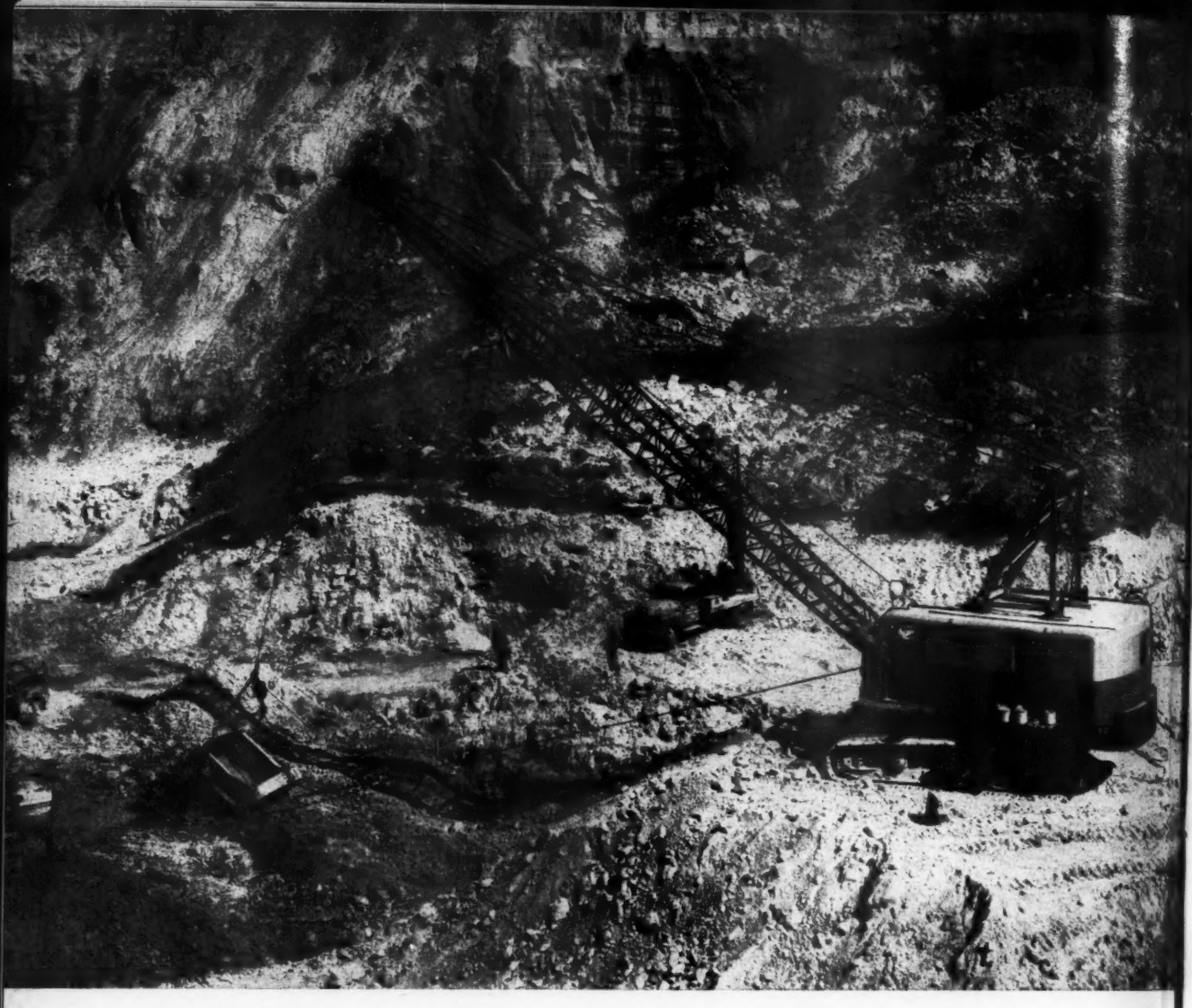
Hercules sales engineers welcome the opportunity to consult with you on your explosives and blasting requirements and to assist in finding satisfactory solutions to your problems.

HERCULES

HERCULES POWDER COMPANY
INCORPORATED
Explosives Department, 917 King St., Wilmington 99, Del.

XR57-1

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Cal.; New York, N.Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Cal.



Marions In Bauxite

An electrically-powered Marion 111-M dragline loads out bauxite at an open pit mine in Arkansas. The machine has an 80-foot boom, 4½-yard bucket and long crawlers which give it added stability on soft footing. One of America's largest aluminum companies operates the mine. This same company and several other companies are using 111-M's in their overseas operations.

CONSULT MARION MINING SPECIALISTS
for lowest costs on your property!

MARION POWER SHOVEL COMPANY • MARION, OHIO
A DIVISION OF UNIVERSAL MARION CORPORATION

(but look at its capacity !)

Here's a recent type of Bethlehem mine car that contains every element of good design and construction. It's as modern as today. So low that it hugs the tracks, it is particularly suitable where headroom is limited. Its overall height is a scant four ft. Yet, when level-full, it has a capacity of almost 15 tons of coal.

This is an all-welded car equipped with automatic couplers, rubber draft gear, cast-steel trucks, roller bearings, and forged-steel wheels and axles. It is designed for rotary dump.

The car is one of a sizable fleet that Bethlehem delivered to a West Virginia mine. It is a special model designed to meet the needs of that particular set-up. You yourself may prefer some other design — but whatever your haulage requirements, Bethlehem can build the appropriate car.

Feel free to consult with our engineers when technical aid is desired. They will gladly help you design welded or riveted models for end-dump or rotary-dump service. And when the plans have been approved, you can count on the Bethlehem shops for a thoroughly expert building job.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

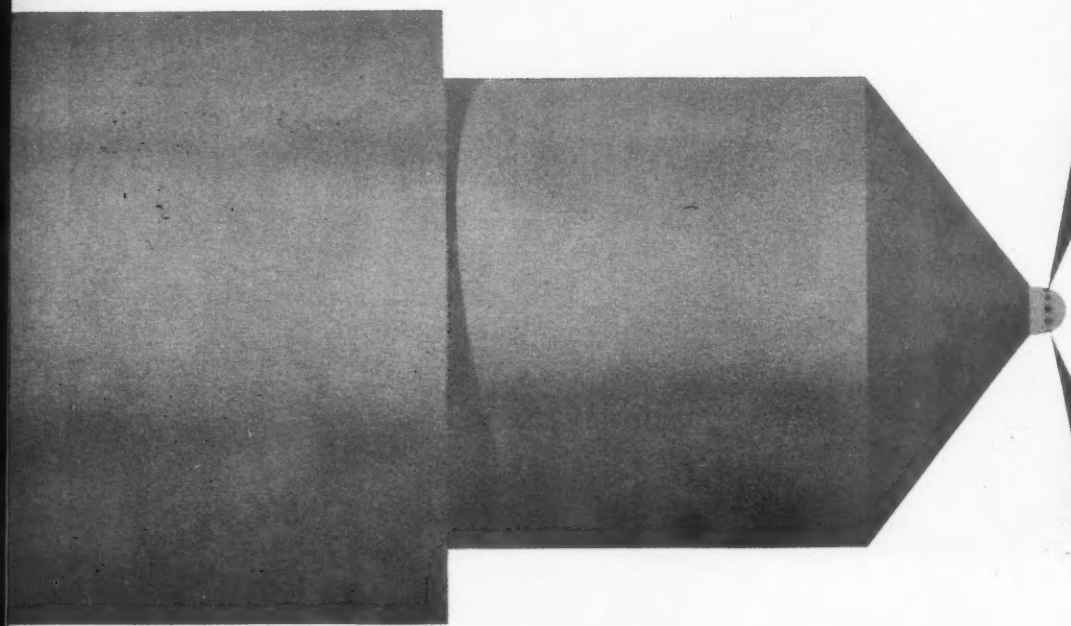
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

How STANDARD DIESEL FUELS

can help you cut coal hauler engine maintenance



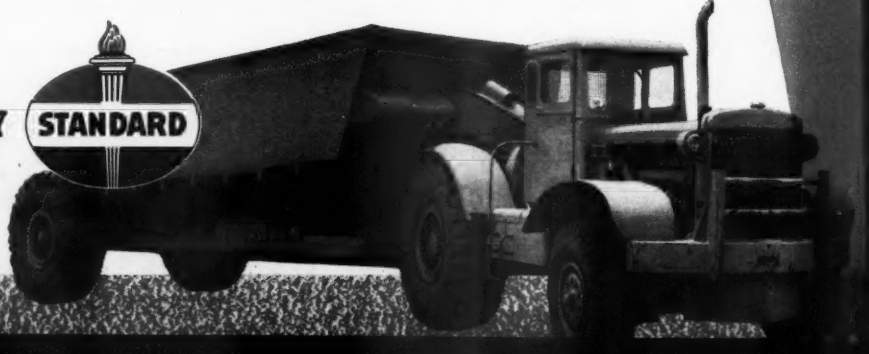
You get three big benefits with STANDARD Diesel Fuels. They mean less engine maintenance, extended time between overhauls, more in-service operation per hauler—*and more profit on each ton of coal.*

1. STA-CLEAN*—a Standard Oil exclusive. This additive in STANDARD Diesel Fuels insures clean burning of the fuel, prevents fuel-injector sticking, minimizes rusting of fuel tank, fuel line and engine parts.
2. Clean fuel. Standard Oil exercises special care in handling your diesel fuel to make sure it is delivered to you *clean.* Contamination is eliminated. There's no foreign matter in the fuel to cause engine failure or maintenance problems.
3. Balanced distillation means you get good, economical engine performance. Cleaner engines mean better performance and longer periods in service between overhauls.

Check in with your Standard Oil industrial lubrication specialist for more facts about STANDARD Diesel Fuels. There's one of these specialists near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

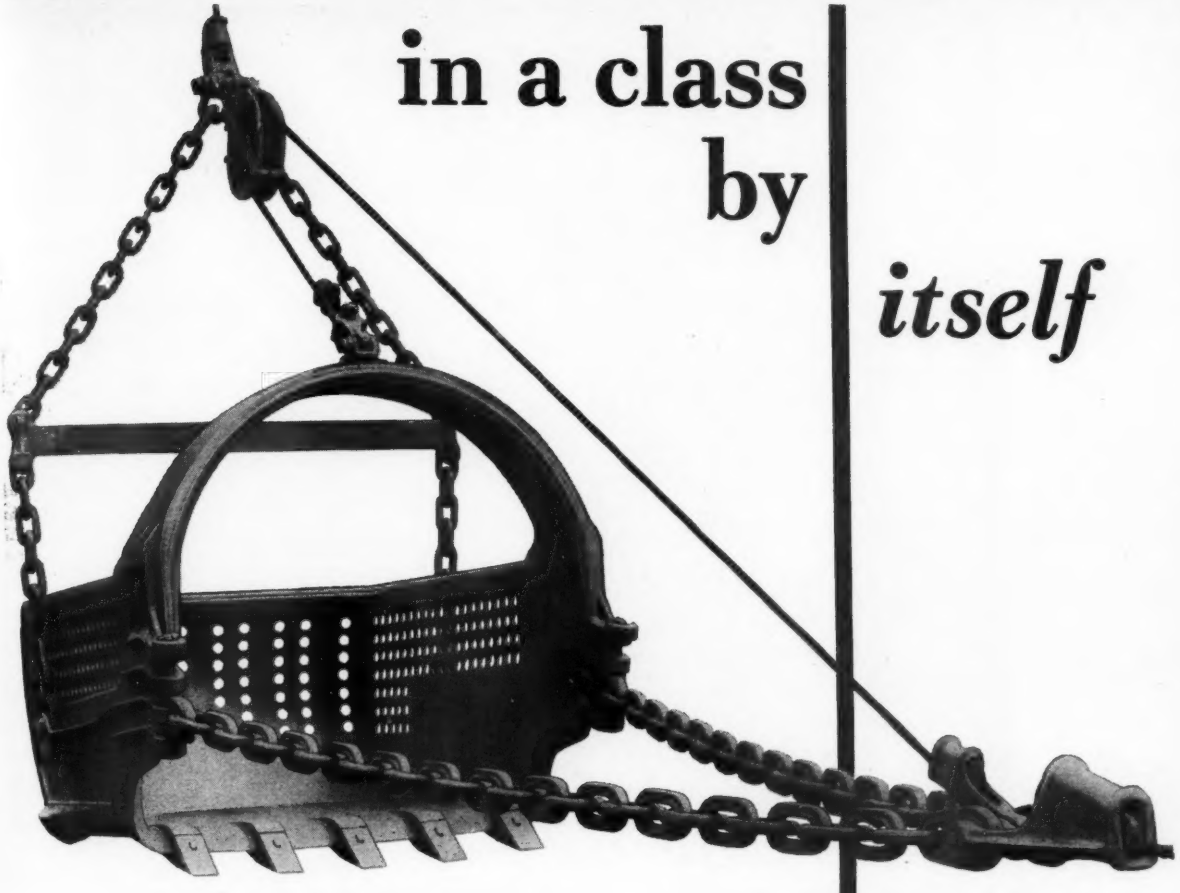
STANDARD OIL COMPANY
(Indiana)

STANDARD



*Trade Mark

in a class by *itself*



"HENDRIX MH"

Heavy Duty Mining Buckets

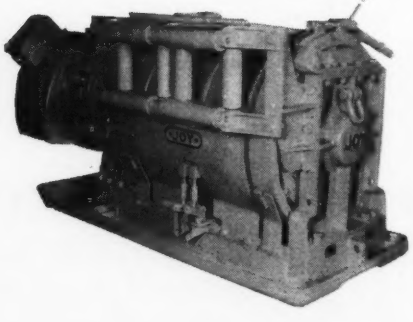
- HIGHER ARCH
- GREATER WIDTH
- TAPERED BASKET
- ARCHED LIP
- EXTRA REINFORCING THROUGHOUT

4½ to 14 Cubic Yards With or Without Perforations

HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA

Hendrix Dragline Buckets

MEDIUM IN SIZE . . . LARGE IN CAPACITY
A NEW CONTINUOUS-RATED SLUSHER FROM JOY



The C2F-211A is a *new* kind of slusher. It is the size of a medium capacity machine . . . compact and portable enough to move from place to place in the mine. Yet, it approaches large capacity slushers in load lugging ability and hour-after-hour stamina.

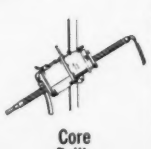
To meet extra-heavy digging requirements this newest Joy slusher is powered by a 50, 60, or 75 HP high-torque, high slip, flange-mounted motor. The high torque developed pulls the scraper through the pile without stalling. By eliminating repeated stalling and starting, fewer shock loads are imposed on the machine. Other features, such as *three* idler gears in each drum's planetary system provide 50% greater capacity.

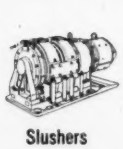
Depending on motor horsepower and rope pull desired, rope speeds range from 165 to 350 feet per minute. Find out more about the C2F-211A, the new medium-sized slusher that hauls the bigger scraper loads. Write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WSW M 6703-183

WRITE FOR FREE BULLETIN 183-3

JOY . . . EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY


Core Drills


Slushers


Rock Bits


Trackless Equipment

this is the **TS-360**

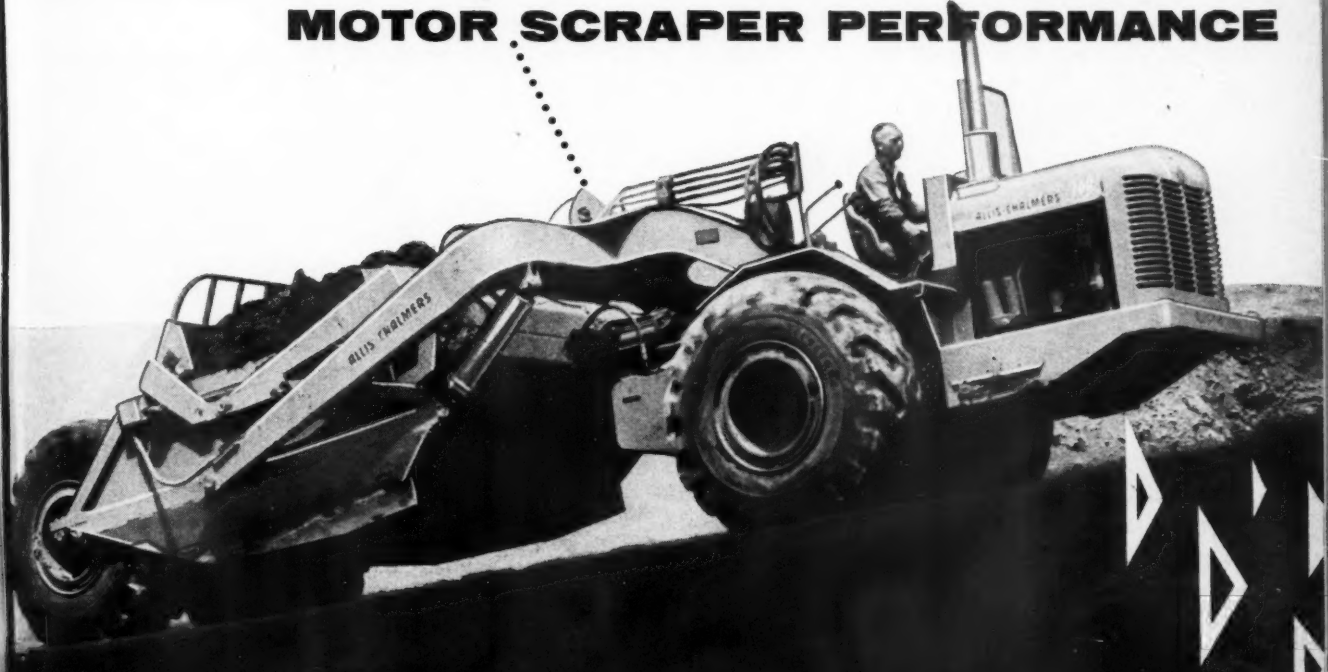
15 yd struck
20 yd heaped
280 horsepower

this is the **TS-260**

11 yd struck
14 yd heaped
200 horsepower

now...

ALLIS-CHALMERS BRINGS YOU ANOTHER NEW MEASURE OF MOTOR SCRAPER PERFORMANCE



the TS-160

NEW Allis-Chalmers TS-160

7 yd struck

9.5 yd heaped

155 horsepower

5 speeds to 25.4 mph

12-ton payload

Measure these advantages for

22 hp per struck yard—Big Allis-Chalmers supercharged diesel engine delivers extra lugging ability for tough pulls, fast loading. Versatile TS-160 can team up with big equipment or work alone on long- or short-haul stripping jobs—handle a wide range of utility jobs, travel at speeds up to 25.4 mph.

Measure these features . . . Allis-Chalmers 516-cu-in. diesel engine—dependable power at all working speeds • Independent, constant live hydraulic power for steering and scraper operation • Low, wide bowl—8-ft, 1½-in. cutting edge . . . 3-piece, interchangeable cutting edges . . . double-acting hydraulic bowl lift jacks • Positive hydraulic ejection, high apron lift to full 7-ft, 1½-in. opening • Roomy operator's compartment, easy-to-reach controls, 24-volt direct electric starting, adjustable bucket-type seat, synchronized 4-wheel air brakes • Big push block for all types of pushers—positioned for in-line push • Full-circle visibility while loading, spreading and traveling . . . operating ease under all conditions • 17¾-in. minimum ground clearance in hauling position.

a wide range of earthmoving jobs . . .

Turns non-stop in less than 25 ft with 90-degree hydraulic steering . . . easy maneuverability in narrow cuts, faster cycles without reversing in tight turn-arounds.

Moves quickly from job to job . . . when required, transport wheels are available to meet legal load limits for highway travel.

Allis-Chalmers, Construction Machinery Division
Milwaukee 1, Wisconsin

ALLIS-CHALMERS

Engineering in Action

GENTLEMEN: Have the Allis-Chalmers Construction Machinery dealer serving my area arrange a demonstration of the TS-160 motor scraper for me ☐.

Name_____

Address_____

City_____ State_____

Type of work_____

This is the hose recommended for all pneumatic tools and air drills—for use wherever high working pressures, abrasion and general abuse would wreck an ordinary air hose.

Heavy tools can drop on it. Pieces of rock from blasting can strike it. It can be pulled over jagged stones, grinding gravel—in all kinds of weather. *Throughout all this, U. S. 4810 stays unharmed, delivers full service.*

U.S. 4810 combines super adhesion and extreme flexibility. The rugged service that this hose provides throughout its long life proves that you are wasting dollars if cheaply constructed, short-lived air hose is being used instead of U. S. 4810 Air Hose.

A complete line of hose is obtainable at any of the 28 "U. S." District Sales Offices, at selected distributors, or by contacting us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

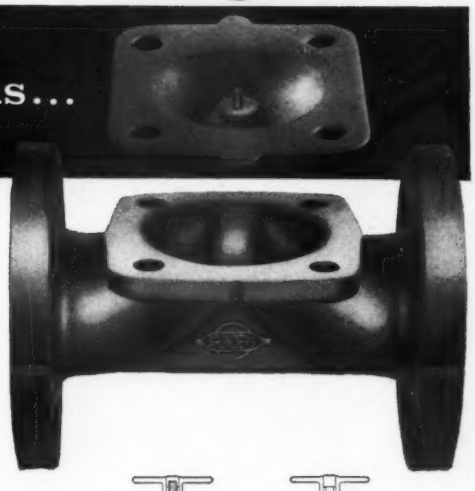
Mechanical Goods Division
United States Rubber

Outperforms other valves under SEVERE chemical conditions

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Backing Cushion

with TEFLON Diaphragms...

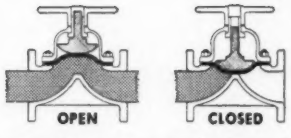


Grinnell Teflon Diaphragms are made by a special process which produces a better product of greater density, toughness and flex life.

The four case histories cited below demonstrate that Teflon offers a very high degree of chemical inertness to some of the most difficult chemicals which industry today must handle. Yet these are only a few of many success stories in the Grinnell files.

Diaphragm life depends on temperature, pressure and frequency of operation. Inquiries must include complete service data to receive prompt and careful attention.

Service Conditions	Saunders Valve	Service Life: Teflon	Service Life: Previous Material
Case 1. Benzene hexachloride (30%-40% benzene, free chlorine); 120 to 130 F, 10 to 20 psi; operated 3 to 4 times daily	Glass lined bodies; Teflon Diaphragm; 1 to 3 inches	10 to 14 mos.	1 to 2 mos.
Case 2. 90%-95% HNO_3 plus 1.8% HF (specific gravity 1.62—1.77) 115 F in summer; 40 F in winter; 125 psi; operated 2 to 3 times daily	Durimet 20 body; Teflon Diaphragm; 1 to 3 inches	8 months	2 months
Case 3. $AlCl_3^+$ complex; ambient to 220 F; 0-50 psi; operated 1 to 2 times daily	Glass lined bodies; Teflon Diaphragms; 1 to 4 inches	9 months	6 months
Case 4. Sulphuric acid 85%; outside temperature; no pressure; operated 4 times daily	Iron bodies; Teflon Diaphragms; 2½ inches	Still in service after 1 year	3 weeks



OPEN CLOSED

Features of Grinnell-Saunders Diaphragm Valves

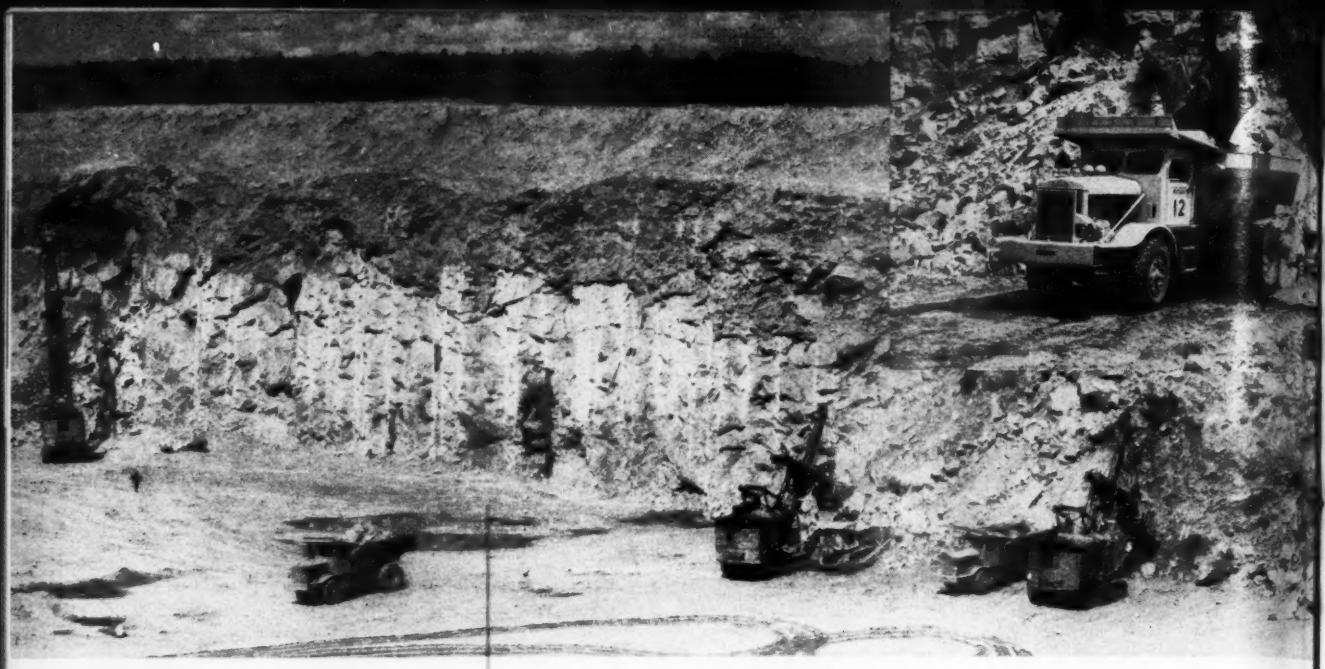
- Diaphragm lifts high for streamline flow in either direction.
- Resilient diaphragm assures positive, leak-tight closure even with grit or scale in the line.
- Diaphragm absolutely isolates working parts from fluid . . . sticking, clogging, contamination, corrosion eliminated.
- Body, linings and diaphragm materials to suit service conditions.
- Simple maintenance. Diaphragm can be replaced easily without removing valve from the line. No packing glands to demand attention. No metal-to-metal seats to become damaged or wire-drawn.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems



NATIONAL GYPSUM (Canada) Ltd. keeps stripping and production on schedule

with "Euc" Scrapers and Rear-Dumps

Euclid equipment proved its reliability and work-ability in the conversion of a peaceful farming area around Milford, Nova Scotia to a gypsum quarry.

Faced with moving a million bank yards of clay and 500,000 tons of gypsum rock, National Gypsum evaluated all makes of equipment—bought four "Euc" Scrapers, including an 18-yard Twin-Power model, and six 22-ton Rear-Dump Euclids for the rock movement. Sixteen months after the starting date, this big quarry site was stripped and graded—right on schedule. To fully clean the initial 15-acre quarry block, 7 million yards of clay are expected to be moved.

During early production at the quarry, four Rear-Dumps were hauling 5500 tons of ore to the hopper in an 8-hour shift. The haulage fleet is now composed of 10 of these reliable 22-ton "Eucs" used in the quarry and in the stripping operation in conjunction with a dragline. Six Euclid trucks currently used in the quarry deliver up to 1000 tons of gypsum per hour to the primary crusher bin.

Have your Euclid dealer give you information on the complete line of Scrapers, Rear-Dumps, Bottom-Dumps and Crawler Tractors... he has proof that ***Euclids are your best investment.***

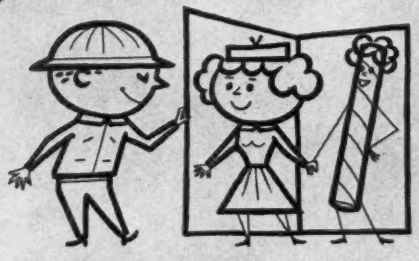
EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

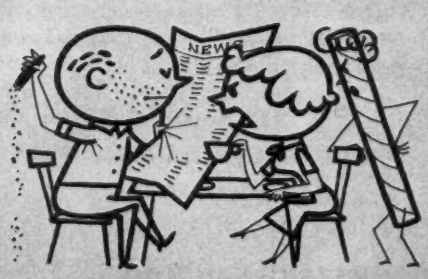
HERE'S A MOVIE FOR POWDER MEN ONLY

"How to handle WOMEN and EXPLOSIVES"



TREAT THEM GENTLY AND WITH RESPECT

PROTECT THEM FROM UNAUTHORIZED PERSONS



OBEY THE DO'S AND DON'TS

to help you blast with greater safety

You'll protect your safety record and gain a smoother, safer blasting operation if you use the new Atlas movie "*How to Handle Women and Explosives*" to help your men observe basic safe practices in their work.

You'll make a deep impression at your next safety meeting with this film which is calculated to bring out amused chuckles and possibly a few guffaws. At the same time it stresses the fact that both women and explosives must be "handled with care" and that both have a list of Do's and Don'ts which must be observed in order to get along with them safely.

Many large operations are using "*How to Handle Women and Explosives*" as a safety meeting kick-off and following with a discussion of the Do's and Don'ts case insert.

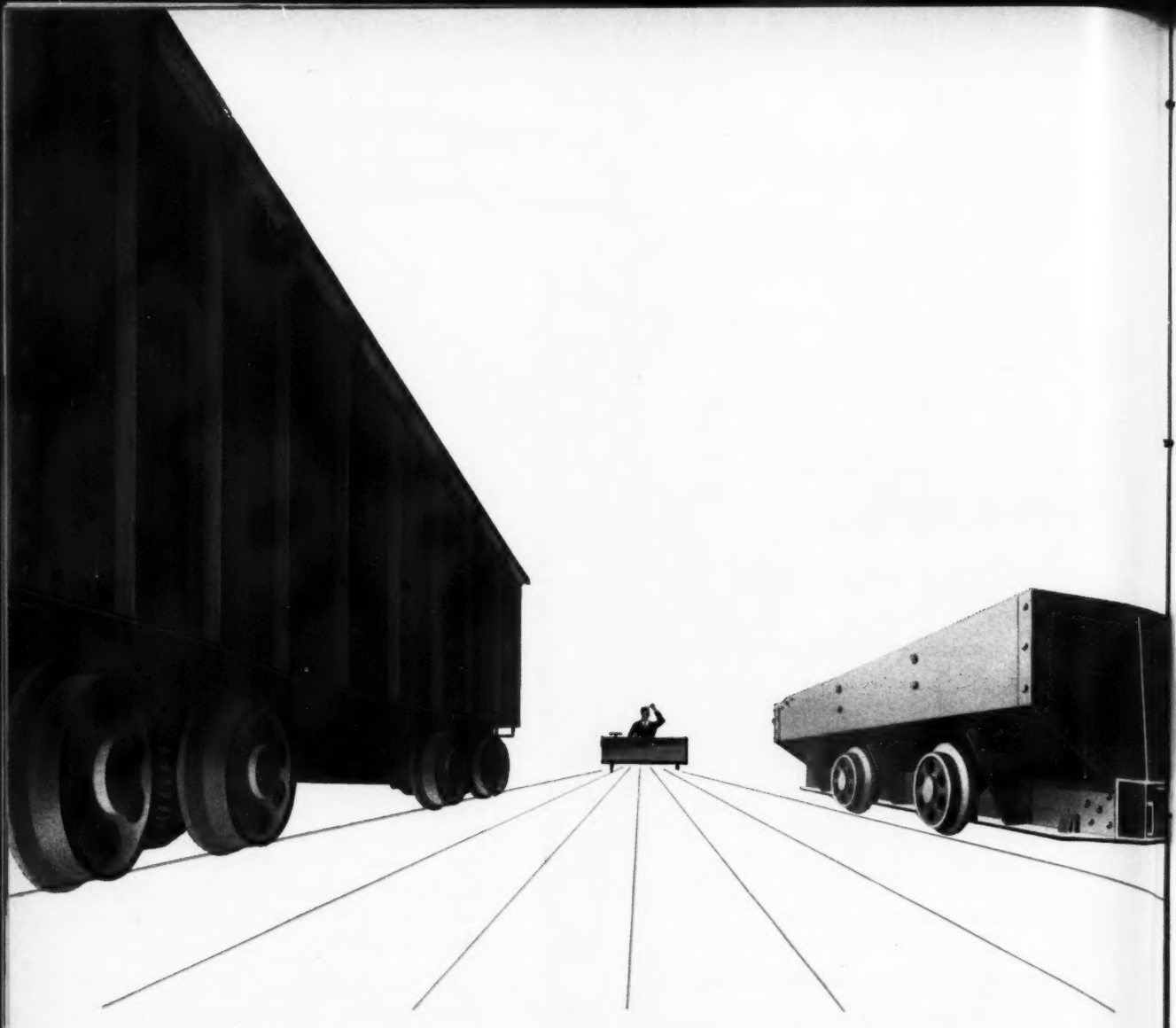
The film, complete with a suggested program kit and enough copies of the Do's and Don'ts for your audience, will be sent to you without cost if you write us on your company letterhead, giving the date or dates you plan to use it.

EXPLOSIVES DIVISION

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

offices in principal cities



HOW LARGE A MINE CAR WILL YOU REQUIRE IN 1965?

The trend is *up*—mine car size projections indicate that by 1965 much larger equipment will be required to meet increased production demands.

When you are planning purchases of new cars, it pays to go to a manufacturer who has the experience and facilities necessary to build the *full range* of types and sizes. acf has been building mine cars for many years, in sizes from 2½ tons to a walloping *30 tons!*

Whether your mining operations call for drop-bottom, end dump, or rotary dump type cars you can depend on acf. All offer modern features, such as anti-friction bearings for safe, high-speed operation, all-welded construction, automatic couplers for speed and safety in handling.

Get full information about the complete line of acf Constant Haulage Mine Cars in the sizes and types to meet your expanding needs. Why not contact the nearest acf office.

acf SALUTES
NATIONAL ANTHRACITE WEEK,
SEPTEMBER 16-22

acf **MINE CARS**

FOR CONSTANT HAULAGE

AMERICAN CAR AND FOUNDRY
Division of acf Industries, Incorporated

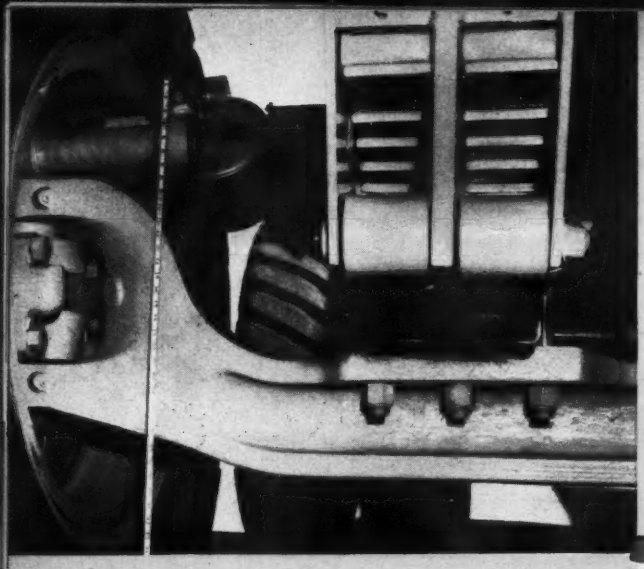
Sales Offices: New York • Chicago • St. Louis • Cleveland • Washington, D. C. • Philadelphia • San Francisco. Plants: Berwick, Pa., Huntington, W. Va., St. Louis, Mo.

Roebling Royal Blue Wire Rope will **wear** and **wear** and **wear**!

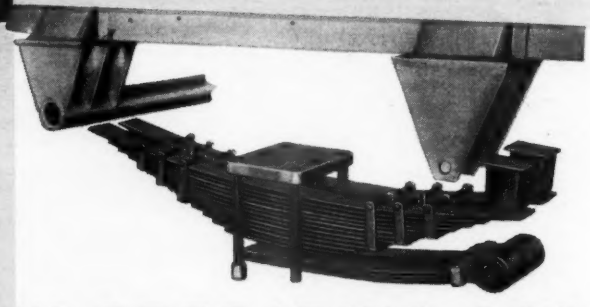
This working quality means longer service life on *your* job. Add to this the fact that Royal Blue is stronger than the strongest rope you have been using and you have two excellent reasons why it has enjoyed faster acceptance than any wire rope in Roebling's history. Your distributor or Roebling Sales Office will give you the complete story, or contact John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Distributors, Branches and Warehouses Throughout the Country—Subsidiary of The Colorado Fuel and Iron Corporation

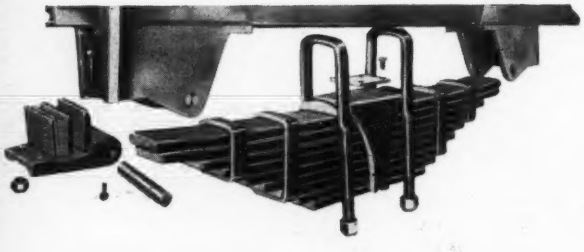


Variable rate front springs in the Kenworth 803 are typical of the specialized engineering which makes Kenworth's complete line of rock and ore movers so outstanding. Rubber-mounted at both ends, the dual springs have steel seats, adjacent to the rubber pads, that shorten their effective length under load. The result is shorter, stiffer springs to compensate for the additional load. Unloaded, the truck rides on rubber. The spring-type radius rods provide positive positioning of the front axle with full flexibility.

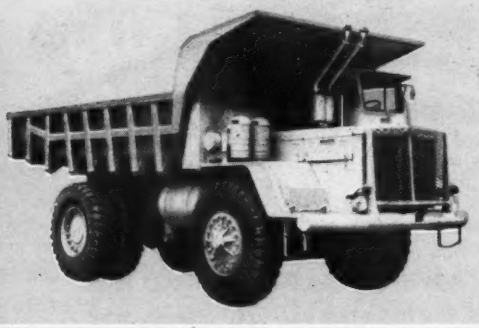


spring mounted

FOR COMFORT—LOW OPERATING COST



Rear springs on the 803 add to Kenworth's record of low maintenance, reduced tire cost, greater riding ease. Stiff rear springs are securely mounted in rugged frame brackets and positioned by use of steel and resilient pads. A spring shroud holds the leaves in alignment. Kenworth engineering proves...

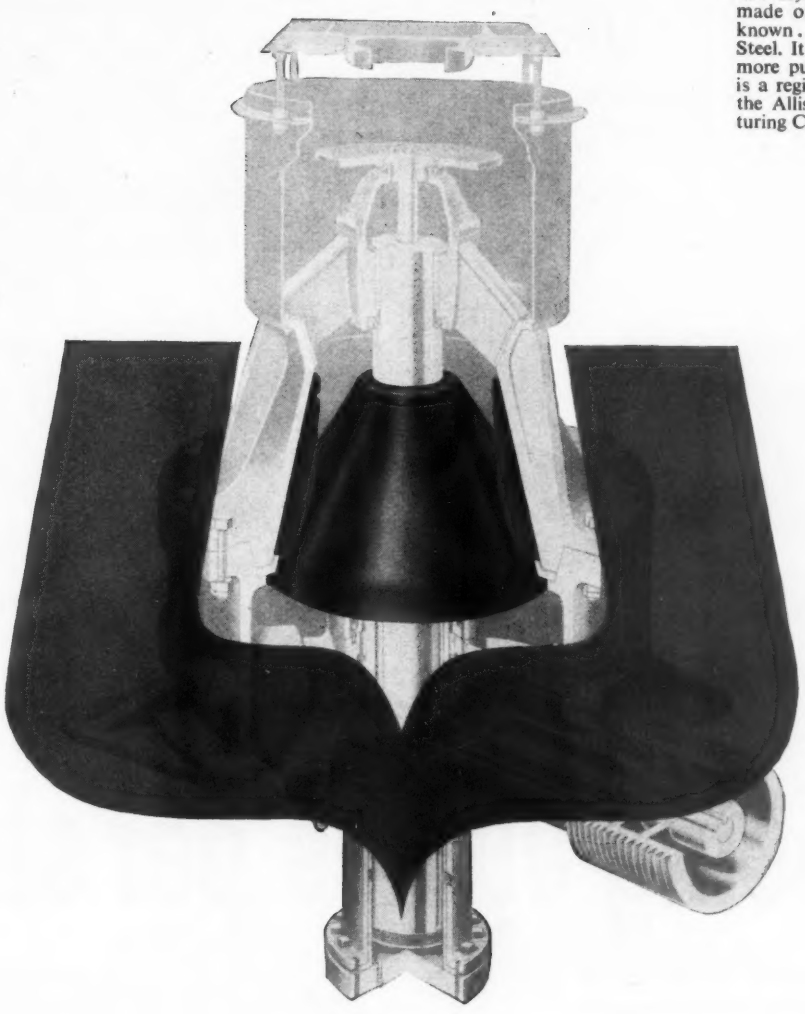


....There's more WORTH in KENWORTH

KENWORTH

MOTOR TRUCKS

FACTORY AND HOME OFFICE: SEATTLE, U. S. A. DISTRIBUTORS IN THE UNITED STATES AND MOST FOREIGN COUNTRIES



Concave ring and mantle of this *Hydrocone* crusher are made of the toughest steel known . . . Amsco Manganese Steel. It *gives* a little, to take more punishment. *Hydrocone* is a registered trade-mark of the Allis-Chalmers Manufacturing Company.

How a little give adds a lot of life to AMSCO CRUSHER PARTS

Both mantle and concave ring crush a lot more feed because of certain properties of Amsco® Manganese Steel. The metal *gives* a little under crushing forces, absorbs stresses, resists cracking and chipping. Yet these same forces work-harden the surface of Amsco Manganese Steel to as much as 500 Brinell . . . a high hardness, stubborn to wear.

Amsco Manganese Steel Crusher Parts maintain their ductile undersurface and work-hardened surface even when worn thin. That's why Amsco parts endure severe abuse for so many work hours without letup.

To be sure of getting Amsco Manganese Steel, order replacement parts from your crusher manufacturer. Amsco makes manganese steel parts for most manufacturers of crushing, grinding and pulverizing equipment.

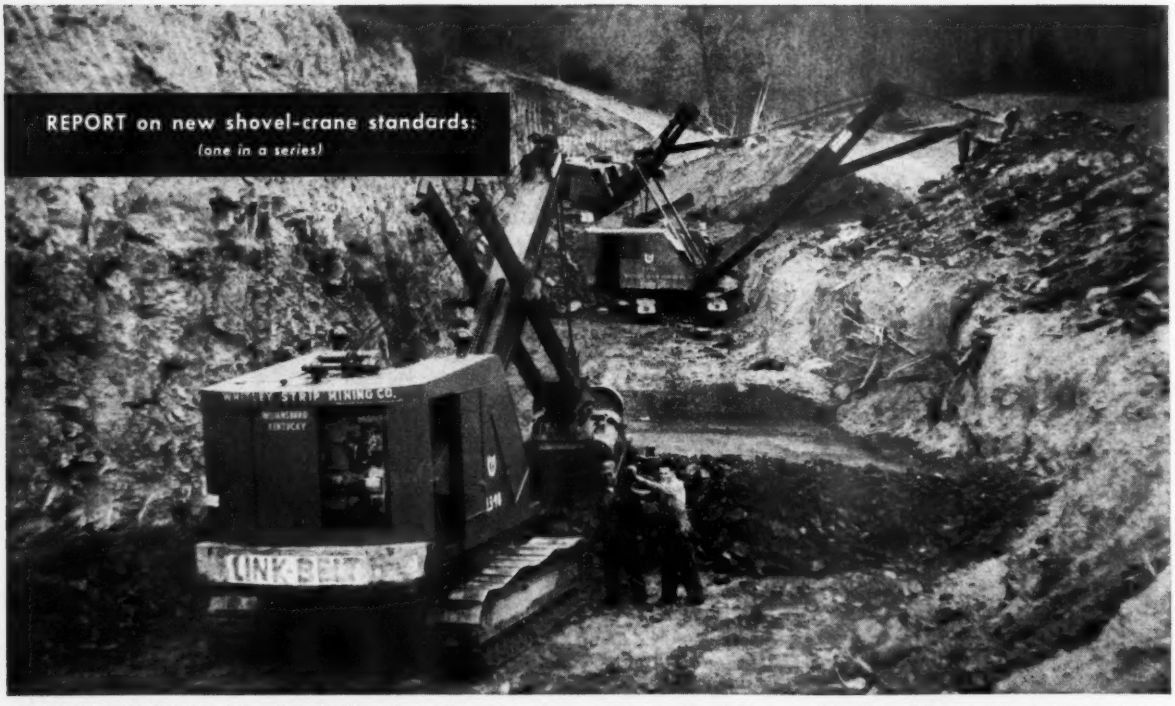
Amsco also produces other alloy steels with maximum wear resistance under particular service conditions

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC



WHITLEY STRIP MINING CO., INC., Williamsburg, Ky., owns four Link-Belt Speeder shovels. The "super" reports, "Believe it or not, I can prove we're getting out more coal with our 1½-yd. K-370 stripping shovel than we did with a different 2½-yd. stripper." He credits this performance to plenty of power, hydraulic power steer and power hydraulic controls.

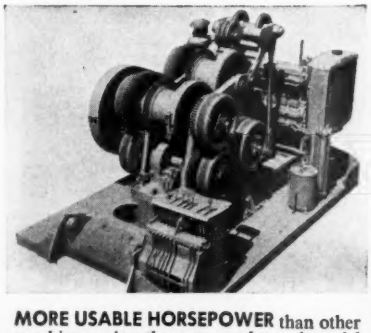
Increasing cycles per shift

Standard on every Link-Belt Speeder, Speed-o-Matic power hydraulic controls minimize operator fatigue. Response is fast, positive, precise

Exclusive with a Link-Belt Speeder, this true power hydraulic control system allows the operator to put his machine through its paces at the flick of the wrist. He's not subject to costly end-of-the-shift letdown . . . stays fresh, pushes his machine to its high limit throughout the shift.

Hydraulic-actuated clutches are self-compensating for heat and normal lining wear. Kick the engine over and go to work. There are no frequent stops for clutch adjustments.

It's advantages like these that put Link-Belt Speeder years ahead of the field — in productivity, in low maintenance and service costs. Start having your equipment dollars earning bigger returns. See your Link-Belt Speeder distributor now. Or write: Link-Belt Speeder Corporation, Cedar Rapids, Iowa.



MORE USABLE HORSEPOWER than other machines using the same make and model engine. Yet a Link-Belt Speeder remains well within the engine manufacturers' recommended operating speeds. It's possible because a Link-Belt Speeder is an extra-strength machine, designed and built to take full advantage of an engine's available power. This extra strength is evident in the size and quality of shafts, gears, clutches and structural members.

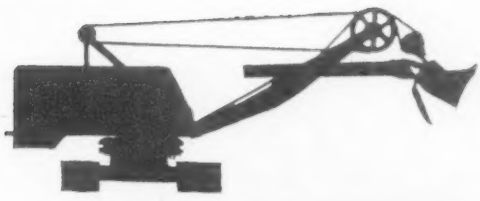
TRUE POWER HYDRAULIC CONTROLS—A Link-Belt Speeder exclusive, Speed-o-Matic power hydraulic controls transmit pressure through oil directly to the clutches . . . eliminate over 150 wearing mechanical parts. Clutches engage smoothly, positively—without jerk, jump or lag. Oil is maintained at proper pressure by an engine-driven hydraulic pump.

14,541

It's time to compare . . . with

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls



WHEN THE DIGGING GETS REALLY TOUGH

Patent Applied for

ESCO WEAR CAPS CUT ADAPTER REPLACEMENT COSTS!

ESCO replaceable Wear Caps protect point adapters for long-wearing life.

Wear Caps are rugged, heat treated, high Brinell, 12M Castings, that slip over the top front of the adapter to protect the adapter from abrasive wear.

Replace the cap and not the adapter.

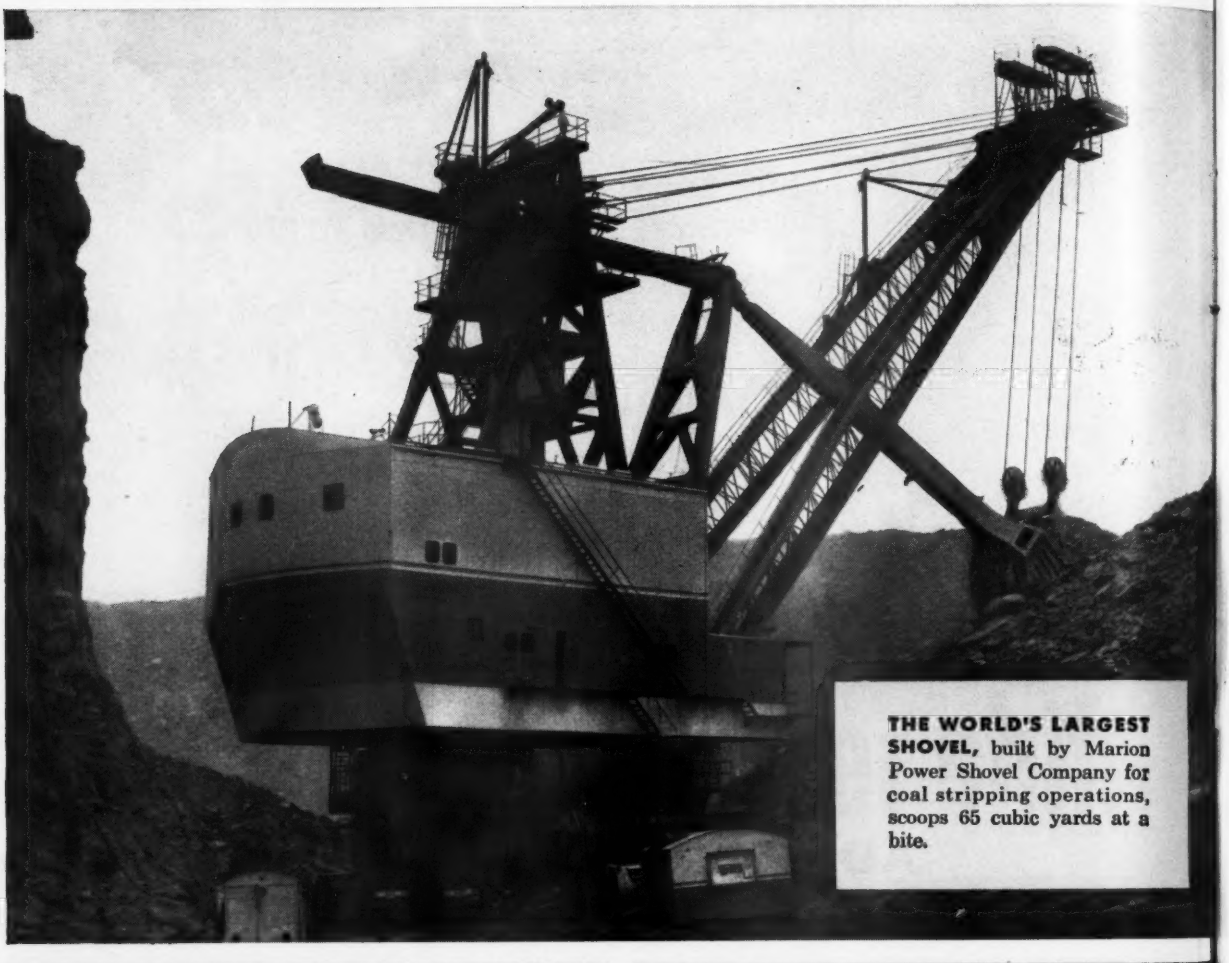
Designed specifically for large shovels, to cut adapter replacement in hard rock and other extreme conditions.

See your nearest ESCO dealer.
Ask for ESCO Tested Points Catalog No. 187.

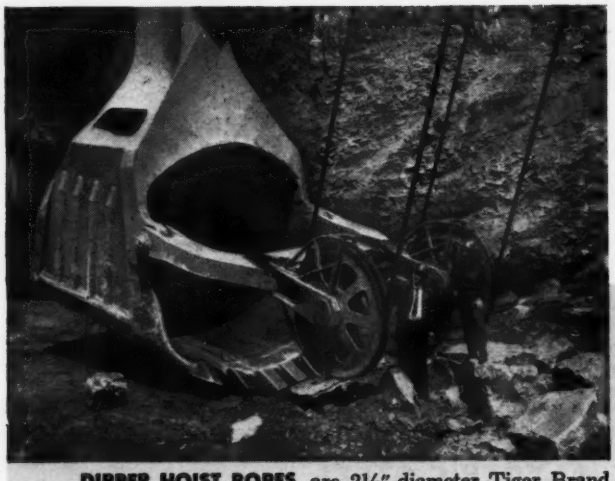
ELECTRIC STEEL FOUNDRY COMPANY

2178 N. W. 25TH AVE. • PORTLAND 10, OREGON
MFG. PLANTS AT PORTLAND, ORE. AND DANVILLE, ILL.
Offices in Most Principal Cities
ESCO INTERNATIONAL, NEW YORK, N. Y.
IN CANADA ESCO LIMITED

Every year, THE WORLD'S



THE WORLD'S LARGEST SHOVEL, built by Marion Power Shovel Company for coal stripping operations, scoops 65 cubic yards at a bite.



DIPPER HOIST ROPES are 2½"-diameter Tiger Brand 6 x 49 Excellay Preformed.

TIGER BRAND 3⅝" boom-support strand has been used by coal companies since 1949 and has proved safe in service on big shovels.

LARGEST SHOVEL could load a train 3,460 miles long

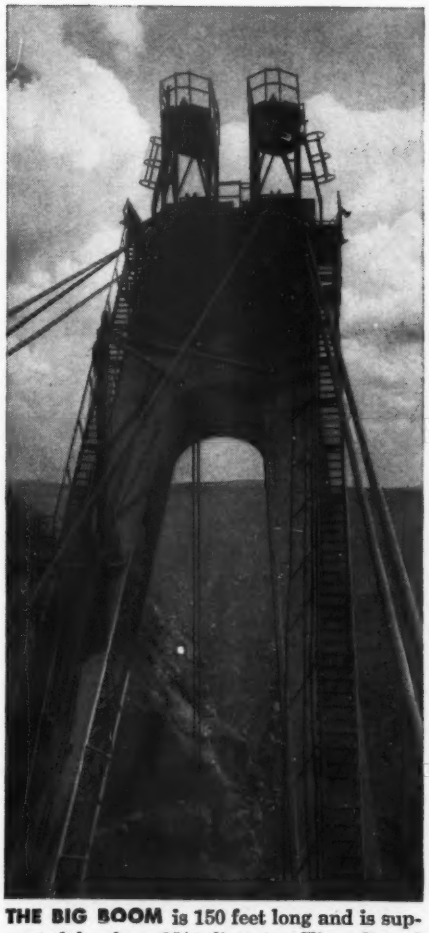
THE world's largest shovel moves an average of 1,614,530 cubic yards of overburden a month. In 12 months, this would fill a train of 70-ton coal cars 3,460 miles long.

The wire rope that performs this miracle is USS American Tiger Brand 6 x 49 Lang Lay Monitor Excellay with Independent Wire Rope Core. Two ropes 2½" in diameter and 580 feet long hoist the huge bucket that scoops up 90 tons at a bite.

The shovel can deposit a load in 45 seconds and be ready for the next scoop. This is one reason for the high production rate.

The boom supports have a catalog strength of 768 tons each, making a total of 3,072 tons for the four strands. These consist of 115-foot lengths of 3⅝-inch Tiger Brand Galvanized Boom Support Strand. The big advantage of boom-support strand over wire rope for this application is that if any breaks occur in individual wires, they show up first on the outside layers and are clearly visible.

The use of 3⅝"-diameter strand for boom supports on large shovels was introduced in 1949 as a result of the combined studies of coal company engineers with those at American Steel & Wire. It is a proven boom-support assembly which has become increasingly popular. Let us give you the facts.



THE BIG BOOM is 150 feet long and is supported by four 3⅝"-diameter Tiger Brand Galvanized Boom Support Strands with a minimum breaking strength of 768 tons each.

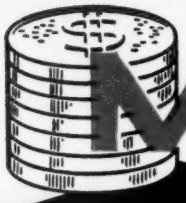
AMERICAN STEEL & WIRE DIVISION
United States Steel, General Offices: Cleveland, Ohio
Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors · United States Steel Export Company, New York

USS AMERICAN TIGER BRAND WIRE ROPE
Excellay Preformed

USS

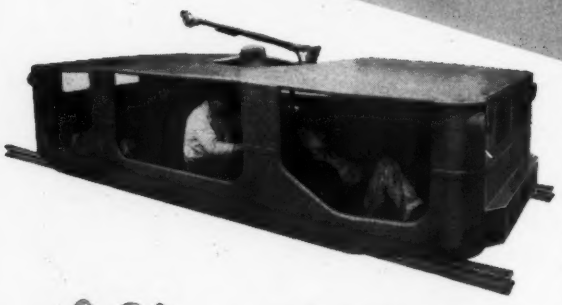
UNITED STATES STEEL

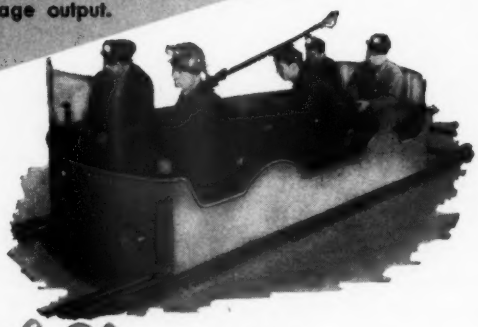
Time is Money - SAVE IT



with the Lee-Norse BUS & JITNEY

Take a real good look at these LEE-NORSE "TIME-SAVERS"! Like modern misers they hoard minutes into extra productive hours by cutting portal to portal time—reducing costs—increasing tonnage output.





Lee-Norse MINE PORTAL BUS

(Locomotive Type)

This self-propelled Portal Bus for hauling section production crews to and from the face is unique with its split roof construction giving the driver an unimpeded, all directional view . . . the trolley is always within easy reach of the operator. Our standard low and high type Portal Bus operates in the majority of coal mines and will haul from 13 to 20 Men. This Portal Bus is powered with one (1) large motor (15 H. P.) and has two (2) independent braking systems for complete safety — (airplane-type) disc brakes hydraulically operated on each axle and dual mechanical hand operated service brakes on each wheel.

TIME IS MONEY — SAVE IT with the Lee-Norse Mine Portal Bus!

Lee-Norse JITNEY

Wherever they're in use—they're regarded as a time saving asset. Fleet and versatile the Jitney furnishes quick, sure transportation to and from the working face for key personnel, inspectors, engineers, etc. When required the Jitney can be pressed into service as an ambulance and is suitable for pulling fire fighting equipment.

TIME IS MONEY — SAVE IT with the Lee-Norse Jitney.

Write NOW for Literature

Lee-Norse Company

CHARLEROI, PA.

DESIGNERS AND BUILDERS OF THE FAMOUS LEE-NORSE MINER

With 30 to 50 percent fewer moving parts this Allis-Chalmers diesel . . .

. . . puts more power to work

THERE IS UNUSUAL SIMPLICITY in Allis-Chalmers engines. The 6DA-844 diesel shown working above, for instance, *has 30 to 50 percent fewer wearing parts than competitive engines!*

THAT MEANS LESS WEAR . . . LESS THAT CAN GO WRONG when parts are fewer and stronger. Your equipment keeps working; you do more.

MORE POWER GOES TO WORK with Allis-Chalmers engines — not only because there are fewer moving parts, but because more efficient combustion means maximum power from the fuel.

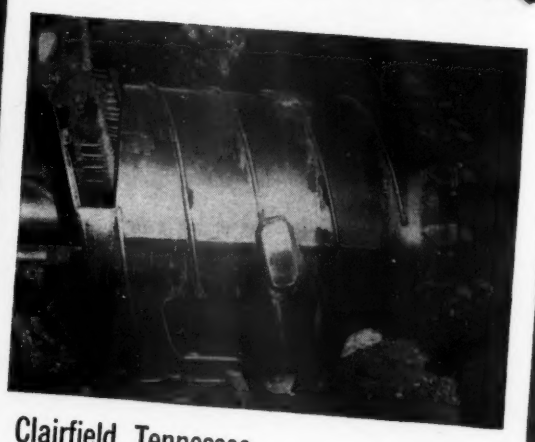
You can have this simplicity, economy and durability in Allis-Chalmers engines of *any* size or type, 9 to 516 hp — *any* fuel, LP or natural gas, gasoline or diesel — for *any* application. See your Allis-Chalmers dealer for full information. Allis-Chalmers, Buda Division, Milwaukee 1, Wisconsin. 8C-7B

ALLIS-CHALMERS *Engineering in Action*

Cinderella, West Virginia

87,895 tons of coal in eight months at a bit cost of $.0213 per ton

Kennametal* U8C Cutter Bits set this record while mounted on a Model 28, 44-inch head Compton Auger operated by the Sycamore Coal Company. Superintendent Jack Kent reports about 25 tons of coal recovered from each of the holes, bored to a depth of 60 feet.



Clairfield, Tennessee

27,000 tons of coal in two months from 30 Kennametal Bits

Cedar Hill Mining Company mounted Kennametal U7 Bits on a 15 Bit McCarthy Auger to cut outer clearance, and U10 Bits for straight ahead and inner positions. A 6″ Kennametal SD Strip Bit acts as core breaker. Partner Herman Selvey reports 27,000 tons of coal mined in two months with no bit regrinding necessary. Holes were drilled to a depth of 125 feet.

KENNAMETAL CUTTER BITS

cut costs of High Wall Auger Recovery

Long bit life is especially important in auger type recovery, due to the drilling time lost in pulling the auger head. On these two jobs, and others, Kennametal bits are helping to maintain high production rates by staying sharp to the end of the hole, time after time, for long production runs between regrinds. In addition, the free cutting design of Kennametal Bits requires less power and puts less strain on the drill.

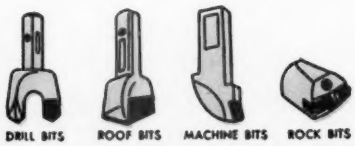
Ask your Kennametal Representative to help you select and actually test the Kennametal Bit designed to match your operating conditions.

KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

C-3085

* Trademark

INDUSTRY AND KENNAMETAL ...Partners in Progress



EDITORIALS

ROBERT W. VAN EVERA, Editor

SEPTEMBER, 1957

TOWARD A SAFER MINING INDUSTRY

THE next issue of MINING CONGRESS JOURNAL will carry the full text of the Declaration of Policy of the American Mining Congress as drawn up in Salt Lake City this month. The portion of this Declaration dealing with Mine Safety will, we believe, be worthy of attention by every mining man—from top executive to the newest employe.

The position taken on this subject makes it clear that the industry must continue to attack the problems of safety promotion at every level. It stressed the regional and local approach; the discussions of safety at our national mining meetings; health and safety education within companies and their operating units; research in safety and health, and the fine contributions of the U. S. Bureau of Mines and U. S. Public Health Service in promoting a safer mining industry. It set forth clearly the industry's conviction that "necessary governmental safety regulations should come only from within the governmental structure of the States."

A special session on Safety and Health was set up for this year's A. M. C. Convention at Salt Lake City. A panel of mining men who have been leaders in mine safety, together with key men from the Bureau of Mines and the Public Health Service, appeared on this session to discuss "Cooperation of the Federal Government in Accident Prevention." In addition, outstanding operators and safety engineers showed what an outstanding job the industry has done and presented practical information of help to all those interested in mine safety.

Among other things, last year's resolution recommended, "That the industry publications continue to promote a strong safety campaign and show by experience and economic fact the benefits to employes and industry of an aggressive safety program and that mining operators support this campaign by contributing safety ideas and experiences which have proven worth while in their operations." The JOURNAL, on its editorial page last February, expressed our desire to carry the safety theme to our readers regularly, and as effectively as possible. Response from the industry has been encouraging and we hope our readers will continue to supply factual and inspirational material which will help foster the all-important objective of a safer mining industry.

ORDER OF THE DAY

A PHOTOGRAPH and short news item on page 86 call attention to another stripping shovel of unprecedented size which has gone to work in the coal industry. This time we salute the Peabody Coal Company, which has made news with a shovel having 70 cubic yards of dipper capacity. Although we are convinced that there is somewhere a limit to the size of a piece of equipment for practical and economic operation, we are just as convinced that there is no limit to the progress which is attainable by the forward-looking executives, operators and engineers in the American mining industry.

In the past few years we have witnessed a constant succession of bold technological innovations which have come about at an ever-increasing rate. A recent bulletin from Battelle Memorial Institute observes that an average man's life today spans approximately one-hundredth of recorded history but that he will have witnessed more than half of our civilization's total technological progress. This is the "order of the day"—created by a people striving for a better standard of living.

PROBLEMS OF INDUSTRIAL ADMINISTRATION

HOW many of us really appreciate how many complicated responsibilites have, in recent years, been dumped in the laps of the Industrial Relations Departments of modern companies? Twenty-five or thirty years ago the job was only one of the miscellaneous duties of a superintendent, but circumstances today make it a specialized and critical profession.

In years past, personnel administration involved little more than "checking heads" against a list of names; today, it often requires exhaustive physical examinations, psychological tests and job placement procedures. Carefully planned indoctrination and education of new employes as to the job, department, company, and community are undertaken by many organizations. After an employe is on the job, further training is given—so that he can satisfy his natural instinct to grow.

Wage and salary administration cannot be haphazard or arbitrary but in many cases must conform with union contract clauses and impartial job evaluation findings—as well as with Federal and State labor laws. "Fringe benefits," which may include pensions, insurance, vacation pay, shift differentials, sick leave, welfare and recreation programs, etc., must all be administered.

Labor relations is a broad and exacting field that requires a high degree of skill, patience, psychology and quick thinking. The legal problems encountered in writing a labor contract require detailed study and knowledge of the provisions and history of labor legislation.

Growth in the scope of industrial relations is just one of the reasons why the "front office" that used to be small and quiet is now big and bulging with personnel.

Mechanical Mining in Difficult Seam Conditions

By RAY M. BIGGS

Electrical Engineer
Viking Coal Corp.

NO two mines have the same physical condition, and the methods used in one mine might not be satisfactory in another. Each operation presents an individual problem which must be worked out to the best advantage by the mine management. This article will describe some of the conditions and problems the Viking mine of Viking Coal Corp., has encountered, and the methods it has used in order to overcome them.

General Plant Layout

The Viking mine is located approximately five miles north of Terre Haute, Ind., on the west bank of the Wabash River. It is a slope mine sunk to the vertical depth of 185 ft on a 16° pitch to the Indiana No. V seam of coal. The length of the slope is approximately 455 ft. The entire production from the mine, amounting to 2800 tons per day, is consumed at the Wabash River Power Plant of the Public Service Co., of Indiana, which is located immediately adjacent to the mine property.

The mine run coal is dumped from drop bottom cars into either a 200-ton bin at the bottom of the slope or a 2000-ton storage bin approximately 800 ft south of the slope bottom. This 2000-ton storage bin extends vertically from the No. V seam to the No. IV seam. It was originally used when the entire output from the Viking Mine was lowered to the No. IV seam and transported about 1¼ miles underground to the Saxton mine preparation plant where the coal was washed and processed for the commercial market. This procedure was discontinued in 1951. A 36-in. belt conveyor was then installed from the bottom of the large storage bin and extending to the 200-ton bin at the bottom of the slope. The large bin is now used for storage of coal mined on the night shift. The coal is conveyed up the slope on a 36-in. belt conveyor into the preparation plant, which consists of a 22 by 10 ft Pittsburgh-McNally Rotary Breaker, where it is reduced to 1¼ in. by 0 screenings. It is weighed over a Merrick belt scale and discharged onto a 36-in. belt conveyor belonging to the Public Service Co. The coal is conveyed either directly into the utility company's bunkers or onto a large storage pile on its property. The only cleaning given the coal is the rejection of the heavy impurities from the rotary breaker. The entire output of the mine is hoisted and delivered to Public Service Co. on the day shift.

Seam Conditions

The natural physical conditions in the mine are unusual and are typical of but one locality in the coal fields of the United States. The Indiana No. V seam averages from 46 to 52 in. in thickness and contains iron pyrites or sulphur balls in unpredictable locations and quantities. Most of these impurities occur near the bottom of the vein; however, they may be found impregnated throughout the seam.

The roof immediately above the coal seam consists of 42 to 48 in. of black slate impregnated with large boulders which protrude eight to ten in. into the seam. These boulders range in size from six in. to several feet in diameter. There are 12 to 24 in. of gray sandy shale above the black slate and then several feet of gray clod which has practically no structure.

There is also a small rider vein of coal in the roof varying from 20 ft above the coal, to just a few inches above the black slate. The location of this rider vein to a great extent determines the roof conditions in the mine. Normally roof conditions are fairly good and the roof can be held with standard timbering methods supplemented by roof bolting. The bolts extend through the black slate and are anchored in the sandy shale immediately above.

The bottom of the seam consists of 12 to 24 in. of very soft fire clay which is very detrimental to mechanical mining either with conventional or continuous mining equipment. An average face analysis of the No. V seam contains 9.4 percent moisture, 12.1 percent ash, 4.1 percent sulphur, 11,300 Btu, and the quality of the coal delivered to the power plant is directly affected by the soft fire clay bottom since it is practically impos-

Both conventional and continuous mining methods are employed at the Viking mine, where sulphur balls, a soft fireclay bottom and large boulders in the top—in addition to the fact that underlying seams have been mined—make mining difficult. Despite these drawbacks, production per man-day at the mine compares favorably with the national average

sible to keep from picking up some of the soft material with the loading equipment.

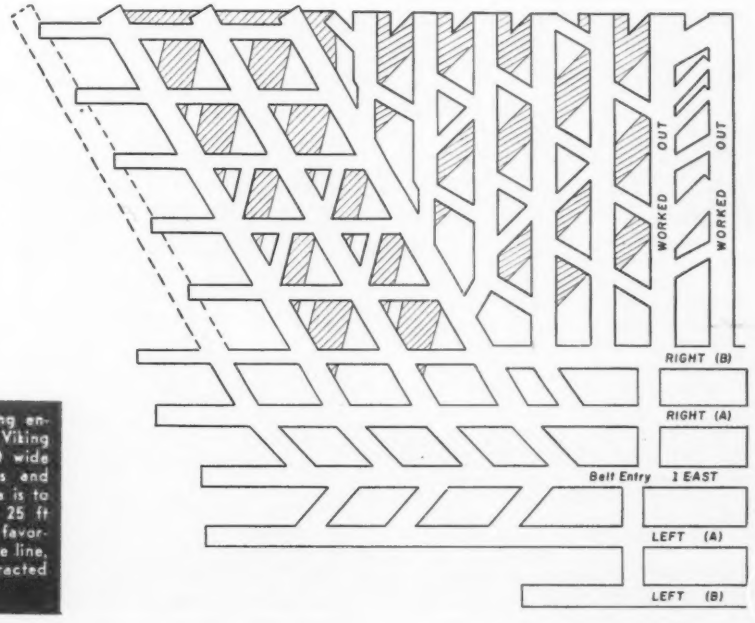
In order to get adequate height for track or belt haulage, the entire thickness of fire clay must be removed. As much as possible is gobbed in worked-out rooms and entries, and the remainder is removed from the mine. The quantity removed from the mine amounts to approximately 5000 tons per month. The fire clay is removed with a conventional 14 BU Joy loading machine, equipped with a special detachable steel blade with a series of manganese teeth which protrude from the front of the blade. In all instances the fire clay is soft enough to be removed without any blasting.

Underlying Seams Add Serious Difficulties

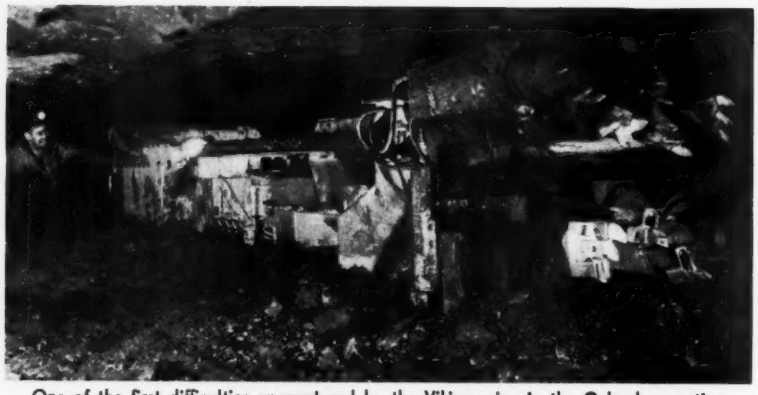
The No. IV seam lies from 100 to 115 ft below the No. V seam, with the No. III seam lying 60 to 70 ft below the No. IV. The No. IV seam averages five ft in thickness, while the No. III seam averages six ft. In some sections of the property the No. IV seam has been mined; in some sections the No. III seam has been mined, while in other sections both seams have been mined out below our workings. This constitutes a very hazardous condition since both seams have caved and the entire strata including the No. V seam is badly broken up. It is sometimes found that the entire No. V seam has dropped two or three ft for a distance of several hundred feet.

In these broken up areas it is practically impossible to hold the roof with either standard timbering or roof bolting and in many instances steel bars must be used. This condition is believed to be aggravated by blasting of the coal with conventional mining methods, since additional caving occurs in the lower worked-out seams due to the blasting operation. It is hoped that this condition will be improved with a continuous mining system of operation since no blasting is required.

In some instances it has not been possible to extract the full amount of coal from the panels due to the fact that the roof in the belt or track entries could not be held until all coal was fully recovered. In these broken up areas, drilling and shooting is a serious problem. Blasting is done with compressed air on shift, and it is impossible to shoot the coal without an excessive amount of large chunks. These large chunks are, of course, difficult to load with loading machines



Sketch shows proposed plan of working entries and rooms with Colmol at the Viking mine. Entries are to be driven 14 ft wide and crosscuts turned on 45° angles and driven 14 ft wide. Cross hatched area is to be extracted from pillars on retreat 25 ft wide and more if roof conditions are favorable. After entries are driven up to the line, pillars left at room necks can be extracted on retreat



One of the first difficulties encountered by the Viking mine in the Colmol operation was transportation. Present plans call for the Colmol to discharge the coal directly onto the bottom where it is picked up by a Joy loader and discharged into shuttle cars

and create quite a problem in the belt transportation system.

Another hazardous condition is caused in these broken areas by the liberation of gas either from the underlying seams or from the rider vein above the No. V workings.

Conventional Mechanical Mining

Until March 1, 1957, the Viking mine had been using only off track equipment. One unit of equipment consisted of the following items:

1 —14 BU Joy loading machine
1 —11 RU Joy cutting machine
1 —Coal drill equipped with two No. 580 CP drills
2 —6 SC Joy shuttle cars
1 —Fletcher Roof drill with Hydroslide
1 —Goodman 36-in. belt conveyor
or
1 —Carloader discharging directly into mine cars
1 —Car spotter hoist
Armstrong air shooting equipment

An average unit crew was composed of the following:

1 —Loading machine operator
1 —Cutting machine operator
1 —Cutting machine helper
3 —Drillers
2 —Shuttle car operators
2 —Air shooters
2 —Cleanup or timbermen
1 —Loading point man
1 —Belt cleanup man
½—Brattice man
1 —Electrician
1 —Foreman

16½—Men

During the month of March the mine averaged 368 tons per shift with these units, with an average of 22.3 tons per face man, or an average of 12.6 tons per man on the payroll.

Methods of Service Haulage

The Viking mine is experimenting with two methods of transporting the coal from the working panels. In one method it uses standard 36-in. belt conveyors discharging into drop bottom mine cars at the mouth of the panel. In the other instance 40-lb track is used in the panels and the coal is discharged from the shuttle cars onto a portable loading head and then into mine cars.

The portable loading head was designed and built in Viking's shop and was designed to be as mobile as possible. New loading points are constructed in the normal course of development work after each 120 ft of advance. The mobile loading head is then prepared for tramming, moved under its own power to the new location and immediately placed in operation, all within a 30-minute period. It has a maximum height of 45-in. and, therefore, extensive roof shooting or ramp building is not required for roof clearance.

There has been no apparent difference in unit production in the use of the two methods; however, there are certain advantages in each. The belt conveyor advantages are as follows:

1. **Permits closer timbering where bad roof conditions are encountered.**
2. **Less fire clay bottom to be removed.**

The advantages of track haulage are:

1. **Less capital expenditures.**
2. **Quicker and less expensive installations.**
3. **Less labor used delivering supplies.**
4. **More frequent move-ups, lessening shuttle car haulage.**
5. **Less travel time of employees in the section.**
6. **Faster maintenance of face equipment.**
7. **Allowance for moving spare equipment into a section in case of breakdowns.**
8. **Lower cost of replacement.**

From the foregoing statements it might appear that track haulage has more advantages, but it is believed that belt haulage will prove more advantageous with continuous mining.

Continuous Mining Trial Installation

Our performance with conventional units is not far from the national average for mines of this type; however, it is not good enough and for some time mine management has been studying continuous mining. It has watched with interest the development of this new method of mining and has made visits to mines in several states, investigating the possibility of using continuous mining equipment in this seam of coal. It was finally decided that there was a possibility that the Jeffrey 76AM Colmol might succeed and a decision was made to give it a trial. This machine was delivered to the mine the last part of February and was placed in operation March 1. The unit of equipment consists of the following:

1—76AM Jeffrey Colmol
1—14BU Joy loading machine
2—6SC Joy shuttle cars
1—Goodman 36-in. belt conveyor
1—Car spotter hoist

The crew consists of:

1—Colmol operator
1—Loading machine operator
2—Shuttle car operators
1—Cleanup man
1—Timberman
1—Loading point man
1—Electrician
1—Section Foreman

Total 9—Men

During the month of March the Colmol unit averaged 257 tons per shift, and 28.5 tons per face man.

New System Requires Changes in Projection

With conventional mining a room and pillar system is used. All entries are driven 14 ft wide on 40-ft centers and rooms 18 to 21 ft wide (dependent upon roof conditions) on 40-ft centers. Main entries consist of six parallel entries which give us adequate places for haulage and ventilation, and also a sufficient number of working places for the development units.

In the room panels, five parallel entries are driven and additional working places are provided by working the rooms along the return air side of the panel as the entries are driven. After the entries have been fully advanced, the other side of the panel is worked on a retreat system. This system provides that all units are operating in fresh air at all times. The belt conveyor, or track, is installed in the center entry in which the fire clay has been removed for proper roof clearance. All breakthroughs and rooms were driven on an angle of 90° from the entries.

As soon as the Colmol was placed in operation, it was found to be impossible to turn break-throughs and rooms at an angle of 90° without sacrificing production; plans were immediately changed to provide for break-throughs and rooms on a 60° angle. A three-entry system is now being used with rooms being worked on the right hand side or return air side of the panel.

An eighteen-ft room is driven on 60-ft centers. Break-throughs, both right and left, are driven on 60-ft centers. As soon as the room is driven to its maximum depth, most of the pillar is removed between it and the last worked-out room. This gives us a much higher percentage of extraction in the room work, and it is believed that the removal of the pillar will assure caving in the worked-out areas which should relieve any roof pressure that might develop.

As soon as the three entries have been advanced to their limit and the last right-hand room has been worked, the rooms will then be worked on the left-hand side of the panel on a retreat system and as many room stumps and chain pillars removed as possible. This should give us a much better percentage of extraction than previously enjoyed with conventional mining methods. The accompanying sketch presents a good picture of the system that is now being used.

Service Haulage Problems

One of the first difficulties encountered in the Colmol operation and one which seems to exist throughout the industry, especially in low vein mines, was transportation. The Viking mine started using two 6SC shuttle cars behind the Colmol, hauling to a belt conveyor. It didn't take long to see that this was impractical as it was impossible to completely load a shuttle car to its capacity.

The next system tried was discharging the coal from the Colmol directly onto the bottom and picking it up with a 14 BU Joy loader which discharged the coal onto the shuttle cars. This arrangement provided for quicker shuttle car transportation and better clean-up facilities.

In addition the gear ratio of the loading machine arms and conveyor were changed to provide for a 12 percent increase in the speed of this operation. Mine management is still not satisfied with the transportation system, but knows of no better method at the present time. It is investigating other methods such as the Molveyor and Extensible Belts, but is of the opinion that they are not applicable for our coal height and present system of mining.

This type of mining is being called "Continuous"; however, it is far from that until a system of transportation is developed that will keep the equipment mining coal at the face at least 90 percent of the time.

Compared with track haulage, belt conveyor advantages at the Viking Mine are: (1) Permits closer timbering where bad roof conditions are encountered, and (2) requires the removal of less fire clay bottom

Troubles at the Face

Soft fire clay bottom is another cause of trouble with the Colmol unit. It weighs 26 tons and is supported on two Caterpillar treads ten in. in width. The fire clay bottom being very soft will not support this weight, making it necessary to leave three or four in. of good coal for a hard bottom. The Colmol will not penetrate the boulders hanging from the roof, and it is also necessary to leave four to seven in. of top coal between the boulders. This leaves a workable height of 43 to 46-in. Considerable room and entry pillars will have to be extracted in order to overcome the amount of coal being left near the roof and at the bottom. However, leaving this coal has undoubtedly im-

(*Continued on page* 61)

To decrease loading time the conventional loading machine behind the continuous mining machine was speeded up by 12 percent

EXPERIENCE WITH CYCLONES AT CHINO

Cyclones are being used for thickening of copper concentrates, classification of ore in fine grinding circuits, classification of middling concentrate for regrinding, desanding milk of lime, and classification and thickening of tailings at disposal areas

By PAUL A. LEMKE
Metallurgical Engineer
Chino Mines Division
Kennecott Copper Corp.

A graduate of the New Mexico Western College, Paul A. Lemke was employed by several mining companies in the Southwest before joining the Kennecott Copper Corp. in 1939. He worked successively as assayer, research chemist, chief research engineer and flotation foreman. In 1955 he was appointed metallurgical engineer.

THE use of cyclones at the Chino Mines Division of Kennecott Copper Corp. dates back to 1948. The first model, a three in. diameter unit with a 38° conical section, was a curiosity at the Hurley, N. M., concentrator. The ability of the cyclone to thicken and classify mill products was readily apparent. Metallurgical, operating, mechanical and design department personnel soon cooperated to adapt the device for various uses. Cyclone design was on a "cut and try" basis.

Cyclones at Chino have been tailored to particular jobs, for specific operating conditions. They have been used, generally, to supplement existing equipment or to improve efficiency of an operation. Other work has been exploratory in nature or purely experimental. For these reasons, and because theories concerning design and operation of cyclones have been difficult to apply, the "cut and try" methods are still largely used.

The first production models were built with 20° included angle conical sections. This was adopted because it increased cyclone capacity over that of units equipped with 38° conical sections, and was considered easy to fabricate.

Operated as Auxiliary Thickeners

Overload conditions were encountered frequently in operation of the copper concentrate thickener. Tonnages of concentrate ranged from 500-1500 tons per day, with rapid fluctuations resulting from changes in type and grade of ore milled. Cyclones were successfully adapted for use as auxiliary thickeners, to handle these sudden overloads or emergencies resulting from thickener breakdown.

A six in. cyclone was first tested as a thickener and proved capable of handling 100 tons of concentrate per 24 hours, producing an underflow of 61 percent solids. Approximately 89 percent of the feed solids were contained in the underflow. A 14 in. cyclone was fabricated and installed. Capacity ran as high as 1400 tons per 24 hours. Feed at 27 percent solids was thickened to about 63 percent solids, with 67 percent of the feed solids reporting to the underflow. Overflow was approximately 10 percent solids.

The permanent installation employs two 16 in. cyclones, one a standby, mounted on top of the concentrate thickener. Each cyclone is connected to a by-pass from one of two parallel pump lines feeding the thickener. Pumps are 8 in., driven at 1180 rpm by 75-hp motors. Vertical lift is 46 ft. One pump normally handles the load. The cyclone cylinder length is 11 in., inlet diameter 4 in., vortex finder 5 in. in diameter by 10 in. long, and apex diameter 2½ in. Feed line pressure is about 13 psi at the cyclone. Cyclone underflows are sent to the filters and overflows to either the main or an auxiliary thickener. Control of underflow solids for the wide range of tonnage is achieved by use of a rubber pinch bushing on the cyclone apex. This

The concentrator and smelter of the Chino Mines Division of Kennecott Copper Corp. at Hurley, N. Mex.

has proven effective even though the discharge pattern is distorted.

Completion of the thickener installation was followed by a period of trial of various cyclone structural changes and "gadgets" aimed at control of product densities and size distribution. Several of these were counterbalanced apex valves, which attempted control of feed fluctuations by retention or release of underflow sands according to accumulated weight. Vortex finders with wings, slots and baffles attempted control of the separation at various points in the cyclone interior. Introduction of water into the conical section sought to dislodge fine material from the flow along the wall.

None of these things were particularly successful. This testing did, however, result in adoption of cyclone openings larger in proportion to body diameter than previously, with attendant increase in capacity. Cyclones were found to operate efficiently at lower inlet pressures.

Prove Efficient Classifiers

Initial testing of the cyclone as a classifier was in the fine grinding circuit. A 20-in. unit with 6-in. inlet, 6-in. vortex and 5½-in. apex opening was tested in place of a bowl classifier operating in open circuit. Primary product, at a rate of 2475 tons per day, was pumped to the cyclone. The pump was 8 in., driven at 860 rpm by a 60-hp motor. Vertical lift was about 55 ft. Approximately 71 percent of the minus 100 mesh material in the feed was removed in the overflow, with only three percent of the oversize reporting. Difficulty was encountered in maintaining a sufficiently constant feed to secure stable operation. Cyclone classification was generally, however, as efficient as that of the bowl, with a sharper separation at the limiting mesh.

The tremendous capacities of cyclones, coupled with their ability to classify efficiently, logically led to consideration of an installation for single stage secondary classification on one grinding section.

The normal flowsheet employs two stages of classification following primary grinding. Primary classifier overflow is pumped by a six in. pump to two bowl classifiers. The pump is driven at 860 rpm by a 50-hp motor. Vertical lift is 55 ft. Bowl sands feed directly to two 7 by 10-ft ball mills. The mills are closed circuited with two drag classifiers by means of two 20-in. elevators. Bowl and drag classifier overflows combine as flotation feed.

Primary classifier overflow contains 45-50 percent solids and about 50 percent plus 100 mesh material. A final product containing 20 percent plus 100 mesh material is desired.

Two 24-in. cyclones and one 20-in.

TABLE I
SECONDARY FINE GRINDING CIRCUIT
Comparison of Cyclone and Classifier Products

	Cyclone Overflow	Classifier Overflows
Tons per 24 hours	2345	2333
% Solids	34.0	24.7
Cum. % Weight		
On 35 mesh	0.1	0.1
48	2.2	1.6
65	8.7	8.7
100	20.6	20.6
150	29.8	31.6
200	39.7	42.0
—200	60.3	58.0

TABLE II
OPERATING DATA—CHINO 20-IN. CYCLONE

	Feed	Underflow	Overflow
Inlet pressure, psi	12	—	—
Volume, gpm	1512	607	905
% Solids	51.3	70.1	34.0
Tons/hour, dry	284	187	97
% Plus 100 mesh	53.3	70.0	19.8

unit were installed on the secondary drag classifier floor of one grinding section. The cyclones were valved from a common feed header so any one or combination could be used. The units were closed circuited with the two 7 by 10-ft ball mills by means of an 8-in. pump, driven by a 100-hp motor. Vertical lift was 35 ft. Feed to the cyclones was primary classifier overflow and secondary ball mill discharge, in a pulp of 60 percent solids. Cyclone overflow was flotation feed.

An early result of the testing was the discovery that constant feed density resulted in fairly constant overflow density and size distribution. Recirculation of ball mill discharge to the cyclone feed sump had a stabilizing effect. Remaining operating fluctuations were controllable by manual adjustment of make-up water to the cyclone feed pump sump, to provide constant density.

One 24-in. cyclone of conventional design would not handle sectional tonnage of 2400 tons of new feed per day, plus circulating load, although its capacity was greater than anticipated. Two units operated in parallel produced extremely high circulating loads, from 300-600 percent. Reduction of apex openings caused "roping" of underflow and unstable operation, with tramp oversize reporting to the overflow. Changes in vortex finder length and diameter reduced underflow volume at the expense of increased oversize in the overflow.

The eight-in. feed pump had been speeded to 960 rpm to handle the high tonnages. White iron pump parts had a life of 60-83 hours. The pump was slowed to 765 rpm and life of parts increased to 137 hours. Rubber covered parts were installed and life extended to 1845 hours. Motor current was reduced from 120 amp at 960 rpm to 85 amp at 765 rpm.

Capacity Increased to 2400 Tons Per Day

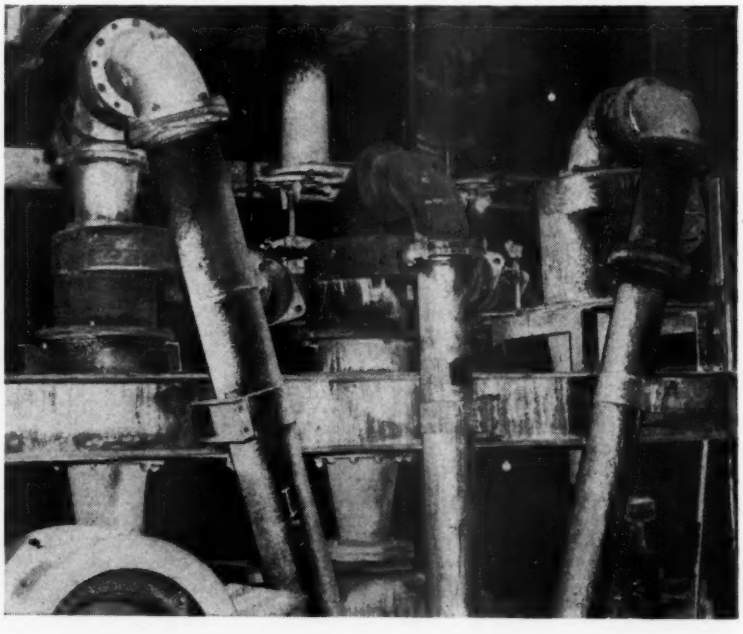
A decision was made to attempt tailoring a single cyclone to the job. The cylindrical section was redesigned, using a spiral feed inlet of larger size. The modification increased the capacity of the 20-in. cyclone to 2400 tons of new feed per day. Circulating load was reduced to 200 percent, as efficiency of classification and stability of operation improved.

The 20-in. Chino cyclone was operated almost continuously for several months, requiring very little attention. The unit, with its eight-in. feed pump, handled secondary classification for the entire grinding section, replacing four classifiers, two elevators and a six-in. pump. Comparative screen analyses of cyclone and normal classifier overflows showed products were practically identical (see Table I). Results of flotation testing indicated some metallurgical advantage due to scouring of particles in the cyclone. Cyclone overflow contained 34-37 percent solids, suitable for use directly as flotation feed, while normal classifier overflows run 25-30 percent solids and are thickened prior to flotation. Preliminary checks on power consumption indicated a ratio of 501 hp for the cyclone to 527 hp for the classifier installation. For operating data on the 20-in. cyclone, see Table II.

Replacement of existing classifiers and elevators with cyclones and larger pumps, and elimination of thickening of flotation feed appears practical. Substantial power savings should be realized.

Testing in progress utilizes gravity feed to the cyclones. A 24-in. cyclone

Battery of cyclone classifiers in the secondary fine grinding circuit



of modified design was installed with the 20-in. unit. Feed is pumped to a surge box from which it drops 24 ft to the cyclone. Feed distribution is handled by plugs in the upper ends of the drop pipes. Successful operation will permit installation of a flexible distribution system to permit inter-connection of any number of grinding sections.

Other Applications

Cyclones have been put to practical use elsewhere at Chino. Extensive laboratory and mill testing had indicated a substantial increase in copper recovery would result from regrinding of middling concentrate prior to recirculation to flotation. A 24-in. cyclone was used as a classifier in plant scale test regrinding, operating in closed circuit with a ball mill. The unit was operated for 17 months, classifying an average of 1600 tons of new middling daily, in a pulp of 13 percent solids, with a circulating load of 100 percent.

Original middling contained 20-25 percent plus 200 mesh material, cyclone feed approximately 33 percent and cyclone overflow 9 percent on 200 mesh. About 71 percent of the undersize in the feed reported to the overflow.

A 16-in. cyclone of modified design is being tested as a classifier for plant middlings, pending installation of a regrind mill. Advantage is taken of scouring of tarnished particles in the cyclone, with products combined for return to flotation.

Cyclones of various diameters have been used to classify tailings for border building purposes at tailings disposal areas. Cyclones are operated on gravity feed from the distribution line on trestles. The units have been used several times in emergencies to fill slime pockets in critical border areas, or to back-fill against high winds. Units of 4½-in. diameter operated successfully at low inlet velocities, close under feed lines, as raises neared completion. Others, of six and nine-in. diameters, were used with long feed hoses.

A 12-in. Chino cyclone is in use at the lime plant, desanding milk of lime. Slacker overflow contained 5-10 percent plus 200 mesh material, some as course as 65 mesh. This product was undesirable for circulation in a pressurized feed system in the mill, from the standpoint of abrasion of piping, valves and orifices. Several sizes of cyclones were tested, in multiples of two and four. The single 12-in. unit proved most satisfactory. Feed is constant, averaging about 12 dry tons per hour, in a pulp containing 15 percent solids. A four-in. pump supplies the unit. Cyclone overflow, containing less than 1 percent plus 200 mesh material, is sent to milk of lime storage.

Cyclone Design

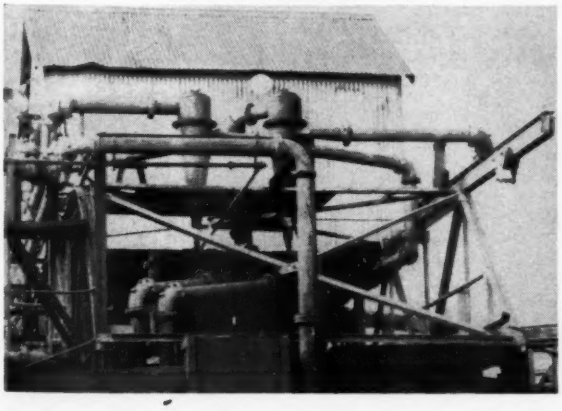
The cyclone design evolved for use at Chino utilizes a conical section of 20° included angle and a cylindrical section of equal diameter and length. The inlet is of square cross section, with dimension of a side equal to one-third the cylinder diameter. The inlet is spiralled around the cylinder for one-half turn, with the inside edge tangent to the cylinder, and the top in the same plane as the top of the cylinder. Vortex finder length is equal to cylinder length. Vortex and apex openings are established on the basis of volume reporting to each. Vortex finders are standard pipe with overflow piping direct connected. The modified inlet permits effective loading of the cyclone cylinder, with a minimum of turbulence.

Cyclones are fabricated in the plant shops, of 3/16, 1/4 or 1/2-in. boiler plate, according to size. Units are fabricated in sections which are fitted with ½-in. thick flanges for bolted assemblies. Sections of conical portions are interchangeable; that is, the section immediately above the apex is common to all sizes of cyclone, with each succeeding size completed by adding another section to the stack and topping it with the corresponding cylindrical section. Small cyclones for temporary service have been manufactured of 16-gauge black iron, effecting a substantial saving in time and cost of fabrication.

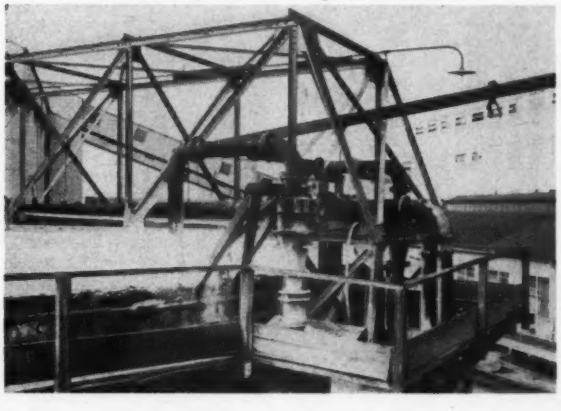
Apex sections, or tailpieces, are fitted with gum rubber discs. Use of silicon carbide and aluminum oxide discs is being investigated. Bodies of cyclones are generally rubber lined. Units handling course materials such as primary classifier overflow are lined with 3/8-in. Linatex. Thinner linings are used for less abrasive materials. Cyclones handling products containing flotation oils are lined with 1/4-in. neoprene sheet.

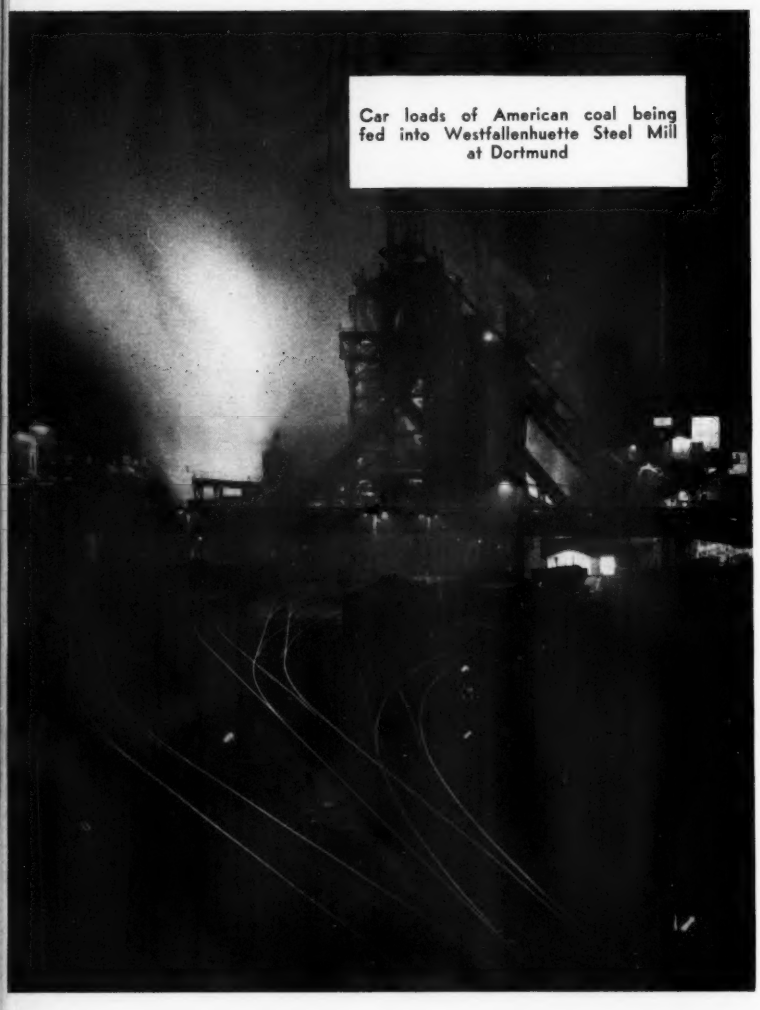
Close-up of one of the oldest cyclone installations at Chino, the concentrate thickeners

Two 16-in. cyclones are operated as auxiliary copper concentrate thickeners



Operating tests proved a single 12-in. cyclone to be most satisfactory for desanding milk of lime





Car loads of American coal being fed into Westfallenhuette Steel Mill at Dortmund

Europe's Rising Need for American Coal

By WILLY H. SCHLIEKER
European Industrialist

Influenced by American coal exports, a revolutionary trend is developing within the West European steel industry—the location of new steel plants at the water's edge, and the use of American coking coal. Here are two articles—one by a European industrialist and the other by a German industrial writer—detailing Europe's dependence on imported coal and its effect on her steel industry

EVERY day the Rhine River is thick with barges, loaded to the gunwales with coal. This has been a familiar sight for decades for those who lived along the banks of the Rhine, but something new has been added. It is a new version of "Carrying coals to Newcastle"—something that was unthinkable only a few years ago. For much of the coal moving upstream into Germany, France and Switzerland comes from distant mines in America, and not from the coal-rich Ruhr, only a few miles away.

Western Europe's industrial boom is creating new, largescale and profitable markets for the American coal industry. In 1954, for example, the six member states of the European Coal and Steel Community (ECSC) imported 12,000,000 tons of expensive U. S. coal; for this year, the ECSC nations will have to import 26,000,000 tons from America alone.

In fact, a special survey just released by the ECSC states flatly that Western Europe has lost its former

independent position in the field of energy. Without a rapid and massive development of atomic energy—and this is not likely in the forseeable future—by 1967 Western Europe will have to import 30 percent of its total energy requirements, most of this in American coal. If these imports cannot be maintained, the economy of these countries may be seriously retarded—just as surely as a child's growth is stunted by insufficient food.

Demand Outstripping Production

For Germans, it is a grim paradox that Germany became a great industrial country largely because of its wealth of Ruhr coal. Yet today, the more German economy grows and strengthens, the more it is dependent on American coal as a prime source of fuel and power.

In Germany today for a variety of reasons—geological, technical, social and financial—coal production seems impossible to increase. There is plenty of coal underground. Under the steel mills and factories of the smoky Ruhr, for example, is an estimated 200 billion tons of coal, with immediate exploitable reserves of about 65 billion tons. But the geological structure of the Ruhr does not permit much mechanized mining. The seams are small; they are deep; they rise and dip in sharp angles. To sink new shafts is an expensive undertaking, when they cannot be exploited with a high degree of mechanization, such as is the case in America.

In Germany—as in other West European countries—coal output can not keep pace with the rising industrial production as statistics plainly show.

In 1948 when West Germany's postwar recovery started, the general index of industrial production stood at 63 (1936=100), while coal production was 79 and electrical power 137. Today the general production index is 215; coal, 126; and electrical power, 384.

West Germany's annual coal output is approximately 131,000,000 tons, with a hoped-for increase of about two percent per year. By contrast, the demand for electrical power is rising at the rate of 13 per cent a year.

Other factors militate against increased coal production. For example, West Germany enjoys a state of full employment, with 17,800,000 people working out of a total population of 50,000,000. The Federal Bank, in fact, reports there are 208,000 job vacancies in industry.

As a result, firms are competing hard for the shrinking supply of available labor. The coal mines are short of workers, as men tend to take equal or better-paying jobs in more pleasant surroundings above ground. If the industry could freely get the workers it needs, another 6 million tons could be added to the annual output.

When the Korean war produced a world steel shortage, Willy H. Schlieker asked German steel plants what he had to do to get deliveries.

"Get us coke!" he was told.

Schleiker found a solution in a coal-steel exchange with the United States. He is given credit for being the first European industrialist to visualize the possibility of basing steel production on American coke.

Said to know more about Europe's steel industry than any other man, Schlieker is the owner of West Germany's second largest individually-owned industrial complex. His companies include rolling mills, a shipping line, a shipyard, a steel export firm and a steel scrap plant.

The miners' union is demanding higher wages and a shorter workweek of 36 hours instead of the present 44 hours. If a 36-hour week is put into effect—and some concessions are inevitable because of the miner shortage—this would reduce production by 23,500,000 tons annually.

In view of this situation alone, it is hard to see how Ruhr coal production can increase even by a few million tons a year.

Moreover, the buildup of the West German armed forces will take half a million of the most physically fit men from the labor market, further aggravating the labor shortage.

The boom in West Germany—as elsewhere in Western Europe—has touched off a wave of reconstruction, repair and the construction of factories, office buildings, homes and large apartment buildings to replace those destroyed on damaged during World War II.

For example, Germany is building more than 500,000 new housing units a year. About 95 percent of these—as well as other buildings—are heated by coal. These installations have also sharply increased the demand for electricity, particularly to operate the literally hundreds of thousands of new radios, TV sets, electrical stoves, vacuum cleaners, refrigerators and other electric appliances that the German workers and middle class are now buying—fruits of the economic boom.

Up go domestic fuel and power demands, and no sign of a leveling off of this rocketing demand is yet visible.

All this means increased importation of American coal. In 1955 West Germany imported 7,000,000 tons; in 1956, 11,600,000 tons; and 1957 imports, it is estimated, will range between 13,000,000 and 15,000,000 tons.

Effect of Suez Crisis

Prior to the Suez Canal crisis, West Germany's petroleum consumption, as in other ECSC countries, was increasing steadily, as was its refining capacity and exploitation of domestic oil deposits.

However, regarding the situation today, the *London Financial Times* of May 10, 1957, commented:

"Colonel Nasser's actions and his aggressive speeches have played their part in an almost revolutionary change in the planning, both of energy supplies and investment and in oil transport. . . . The governments of Western Europe are all equally determined to reduce their dependence on imported fuel."

Esso headquarters in Hamburg has estimated that by 1964 West Germany will need a total of 1408 billion

The geological structure of the Ruhr does not permit much mechanized mining. Seams are small and rise and dip sharply

kcal (1000 caloric units) of crude energy. Of this total, the domestic coal production can supply only 1047 billion kcal, leaving a deficit of 345 billion kcal--the equivalent of 49,200,000 tons of coal.

Naturally the oil companies had hoped to meet a major part of this fuel and power deficit. However, the Suez crisis has placed such likelihood in jeopardy and correspondingly expanded the potential European market for American coal.

The Atom's Place in the Energy Picture

The six ECSC countries have just announced a master atomic energy development plan (Euratom) costing an estimated $6 billion. This plan is designed to meet a fuel and energy deficit which by 1977 is expected to be the equivalent of 300,000,000 tons of coal.

This "crash" program of atomic energy calls for construction of nuclear power plants producing 15,000,000 kw in the ECSC countries. Britain, not in the ECSC but the Continental leader in atomic energy, has a target program of six million kw of nuclear energy by 1965. This compares with the existing total capacity of 17,000,000 kw from Britain's conventional power plants.

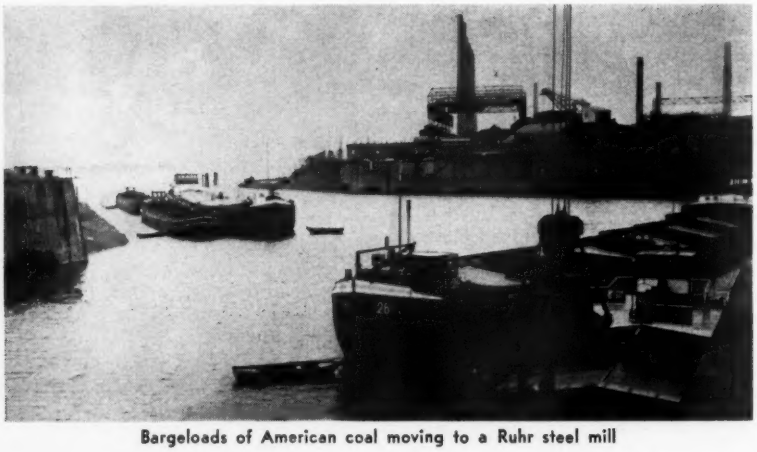
But this ambitious program has to face financial as well as technical difficulties because the European atomic program is still in the research and experimental stage. Only recently was a contract signed for the first commercial atomic power station in Germany, to be designed and constructed by an Anglo-American combine.

Such is the story of coal—and energy—in Germany and Western Europe. The facts indicate that the European economy, despite the development of atomic energy, will be increasingly dependent on American coal for many years to come.

Most German industrialists are convinced that ways must and can be found to cut shipping rates for American coal imports, and to organize such shipments on a vast scale.

Effect of Coal Imports on Western Europe's Steel Industry

European steel production is becoming increasingly linked to ocean transport



Bargeloads of American coal moving to a Ruhr steel mill

Influenced by American coal exports, a revolutionary trend is developing within the West European steel industry—the location of new steel plants at the water's edge.

The pilot plant in European steel's march to the water was Holland's Hoogovens plant in Ymuiden, at the mouth of the North Sea Canal, 15 miles from Amsterdam.

This plant, constructed soon after the First World War, defied all economic laws of that period. It prospered, in the opinion of the rest of Europe's steel industry, only because it had a monopoly in the Dutch market.

With formation of the European Coal and Steel Community, the Hoogovens plant was thrown into competition with the rest of the ECSC steel industry. Hoogovens has proved to be entirely competitive, operating without state subsidy and paying one of Holland's largest annual dividends. Hoogovens stock is considered a blue chip on the Amsterdam exchange—yet the mill imports 50 percent of its coal from the United States.

Despite its prosperity, Hoogovens was viewed as an accident by the European steel industry until the first American coal was imported to West Germany by Willy H. Schlieker during the Korean War steel pinch.

Since then most of Europe's steel mills have turned to American coal, and some German steel mills are now getting up to 25 percent of their coking coal from the United States.

Even prewar, Germany's steel industry was dependent on imported ores, most of it coming from Sweden. Since the war, all European mills have become ore importers. Increasingly, European steel production is becoming linked to ocean transport. The

Lignite is strip mined near Cologne. German's coal shortage has forced the country to exploit every coal source

ingredients—coal and ore—are imported, and the finished steel exported.

The Hoogovens plant thus has become the model for the transfer of a substantial section of the ECSC's steel industry to waterside.

In West Germany, Kloeckner of Duisburg, a major German producer, is building a complete new mill at Bremen on a site covering 9,400,000 square meters (approximately 3.63 square miles) of land, four kilometers (nearly 2½ miles) of which front on the Weser River.

Kloeckner's Bremen mill will have a 600 ton capacity blast furnace and three Siemens-Martin furnaces, each with a 225 ton capacity. The Bremen mill will boost Kloeckner's annual steel production from 1,730,000 tons annually to around 4,000,000 tons.

Heretofore Germany's steel industry has been concentrated in two areas; the Ruhr (because of coal) and the Salzgitter region (because of iron ore deposits, low-grade but usable).

Kloeckner's Bremen mill is geared to Europe's new concept of steel production. Ships will discharge coal and ore at the Kloeckner docks on the Weser, and load fabricated steel export cargoes.

The steel concern calculates that its savings on transport costs will be great enough, based on current steel prices, to allow it to amortize the cost of the new plant in half the usual amortization period.

Kloeckner's executives have no monopoly on the facts of European steel production, and the march to the sea is now beginning in France and Italy as well. French steel concerns will build plants at Dunkirk and Bordeaux. Dunkirk in particular being visualized as the future center of French steel production. In Italy a big new mill will be constructed at Genoa.

Steel Producers Entering Shipping Business

Along with the construction of waterside mills, European steel producers are entering the shipping business, their purpose being to cut ocean freight costs by acquiring their own coal and ore vessels.

In 1956 the German steel industry imported 20,000,000 tons of coal, 12,000,000 tons from the United States. Ore, prewar obtained almost exclusively from Sweden, is now imported from Venezuela, Brazil and Labrador as well.

Now the German steel industry is moving to put ocean transport on a long-range basis. All of Germany's major steel producers have plans to stabilize coal and ore shipments on a long term basis. August Thyssen Huette and Phoenix-Rheinrohr, for example, already have their own carriers in service.

Huettenwerk Oberhausen AG, a unit of Gutehoffnungshuette, has ordered three ships from a Hamburg yard, and plans to do their own coal and ore hauling are being prepared by Schlieker, Kloeckner, Dortmund-Hoerder Huettenunion and Krupp.

Europe's Dependence on Imported Coal

Even now steel produced with American coal is competitive with German coal-produced steel in some areas of West Germany, according to Dr. Hans-Heinrich Bischoff, who made a study of the comparative price structure for the Ruhr coal industry.

Dr. Bischoff warned his clients that continued price increases for Ruhr coal would make imported American coal cheaper to buy in north Germany.

"Already American coal is competitive in north Germany with Ruhr coal," Dr. Bischoff's report said.

Why Western Europe has become dependent on American coal is illustrated by statistics on Europe's coal production over the last two decades, and by a rundown on ECSC's mammoth investment in coal production expansion over the last four years.

The statistics on European coal production in the two decades since 1937, together with figures on ECSC's gigantic coal mining industry investment program, show that no possibility exists that Europe, even by herculean effort as typified by the ECSC investment program, can diminish its independence on imported coal.

On the contrary, statistics show that little apparently can be done to boost European coal output on a Continent-wide basis, and that Europe's

(*Continued on page* 54)

NEW— for one-man mobile coal drilling...

LONG

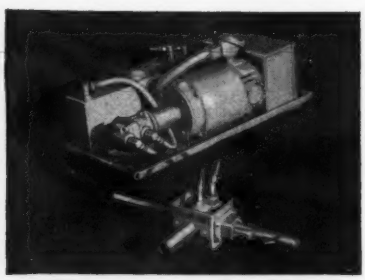
MOBILE HYDRAULIC COAL DRILLS

(USBM APPROVED)

In the 1-M-20 Drill, high pressure permits high horsepower and allows one man to do the work of expensive mounted drills.

Model No. 1-M-20 (one man, 20 pounds) Drill

Model No. 1-M-30 (one man, 30 pounds) Drill



SD-10 unit is designed for mounting on "T" trucks or mobile cutting machines.

The TD-10 can be used with a trailer for supply haulage or conveyor pan moving.

Completely new in principle, these LONG Mobile Coal Drills permit one man to do the work formerly requiring two men with bulky high-priced mounted drills. They're designed with their own hydraulic power units to work at 2000 psi, which permits a weight of only 20 pounds for the 1-M-20 (suitable for drilling all powder holes), and 30 pounds for the 1-M-30 (applicable for Airdox and Cardox holes).

In this new design, an intrinsically safe electric control circuit means the electric motor operates and oil circulates only when the auger is rotating. This spells more efficiency of both electric motor and hydraulic parts and permits a more compact unit because waste energy is not going into heat in the oil system when the auger is not operating. The independent hydraulic power unit avoids tampering with relief settings and provides the high pressure required for most efficient coal drilling.

LONG Hydraulic Drills are available as the TD-10 with self-tramming power unit, or as the SD-10 with power unit designed for mounting on "T" trucks and mobile cutting machines. Both the LONG 20-pound and 30-pound mobile drills can be used with either the TD-10 or SD-10, and can be quickly interchanged at the face.

For details or a demonstration, write . . .

The LONG Company
Oak Hill, W. Va.

Various remedies must be used to keep pace with rising costs. Indian Creek Mine attacked its problem by installing faster haulage equipment and redesigning its loading unit. The necessity of lowering maintenance costs on trucks and other equipment required improved road surfaces, better road upkeep and the equipping of a modern underground shop

MECHANIZATION

At Indian Creek Mine

Of St. Joseph Lead Co.

By ELMER A. JONES
Division Manager,
St. Joseph Lead Co.

A GREAT many companies have been faced with the problem of mining lower grades of ore with higher priced labor, all the while trying to maintain a profit. It's quite a task, and if it were not for a bit of inflation in the price of the product, some of us would not be in the mining business today. But the problem of getting more tons per drill-shift, per loader-shift, and per hauler-shift is very real.

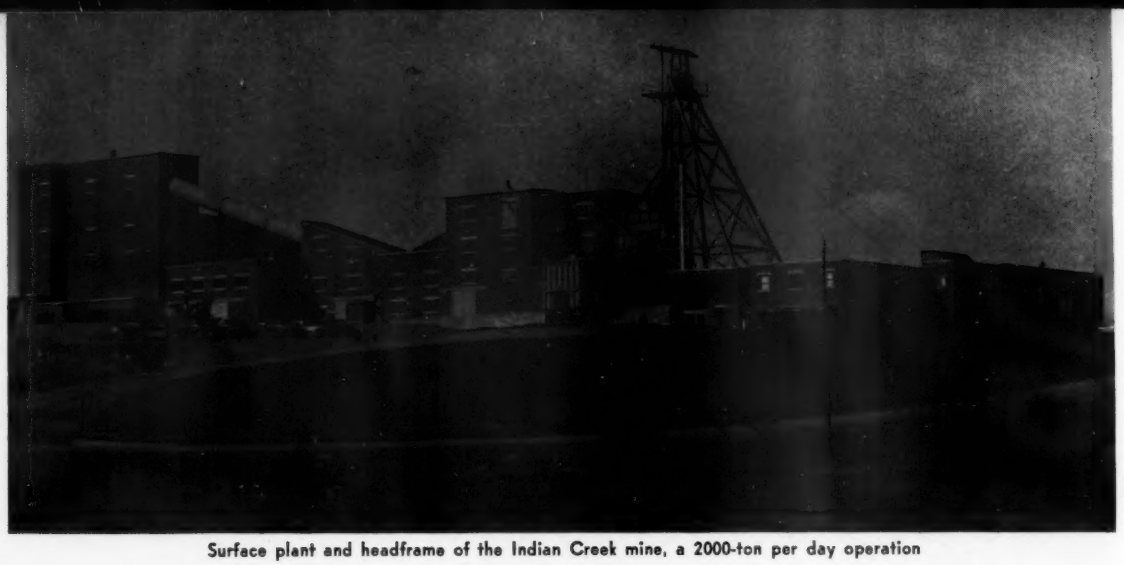
The St. Joseph Lead Co. has operated low grade, high tonnage mines for over 90 years in the Southeast Missouri Lead Belt. Over 30 years ago management realized, that to stay competitive, it must mechanize its operations. That conversion is a long story in itself and fairly well known to the mining industry. It will suffice to say that there were many ramifications and many stages in the program, and the company is not through yet.

Choosing Equipment for New Mine

After all of its years of mining in the Lead Belt, St. Joe recently discovered a new ore body 35 miles to its northwest, deep under the overlying Potosi formation. A comparatively few drill holes outlined what looked like a good sized mine in rock quite similar to that which St. Joe knew so well. But the elevations were quite variable and gave management something to think about. What kind of Lead Belt equipment would best do the job in the new mine?

St. Joe had used, in its loading history, the big unwieldy conventional boom and dipper shovels, and then, working with Thew Co. engineers, had designed and built a shovel to fit its particular needs. After 30 years the company is still using this latter shovel, improved and redesigned to some extent, but essentially the same St. Joe shovel. Today it is using 52 of these shovels and averaging 200 tons per shovel shift, with a maintenance cost of about 11 cents per ton. Eventually, the ore bodies got so small and were of such a low height that St. Joe had to discard all of the larger Thew shovels of the boom and dipper type and replace them with Joy loaders. Today 18 of these machines are being operated, loading more tons per loader shift than the St. Joe shovel, but with a slightly higher maintenance cost. Other kinds of loading equipment include slusher hoists for pulling rock into raises, hoists mounted on slide ramps for loading into cars, Conweigh loaders and Eimco loaders for use in development drifting.

Therefore, when management looked at its new ore body and thought of the likely ups and downs of elevation, it wondered just what kind of loading and hauling machines would best fit the job. Obviously a great deal of development work would be necessary in order to open up enough mining faces to give the required 2000 tons per day. The mine also had to connect with another new shaft which was 3000 feet away for ventilation



Surface plant and headframe of the Indian Creek mine, a 2000-ton per day operation

purposes. Our first thought was to select a machine that could be used not only to work in drift headings, but also do a fair job of loading stope ore. But it must be a machine that would be adaptable to trackless mining, as that system had proved to be most economical in the Lead Belt proper.

Ramp on Rubber

Some time before the Indian Creek discovery, experimental work, under the direction of C. K. Bain, had been done on a slide ramp, mounted on the chassis of a Joy drillmobile. A three-drum hoist, with air-operated controls, was mounted on this ramp. The machine looked so promising to Bain that when he was called on by St. Joe to go to Morocco to advise and consult with its affiliate, Zellidja, he recommended the adoption of this portable ramp for loading ore into shuttle cars. The machine proved to be very popular with the native Arab labor and was used efficiently and effectively, both in drifts and stopes.

To get back to the Indian Creek problem, it seemed wise, at least as a starter, to have such a machine for development work and for moving into stope work as the faces were opened. Consequently, six of these machines were ordered and were on hand and ready to be used when enough room was available at the underground station.

About December 1953, drifts were started in three directions, and single-shift operation began in the new 2000-ton mill. In a few months it became evident that the ore bodies were going to be very irregular, and that they would be on a pitch of from 5° to nearly 45°. The room and casual pillar method of mining used in the Lead Belt could be used, but the grade of ore would be very dependent on close, selective mining. The stopes were going to range from 10 ft in height to a possible 50 or 60 ft. The ground was easily drilled, but due to lack of floors or partings in the rock, was hard to break without a considerable amount of secondary blasting. Stopes would probably be 75 to 100 ft wide, with pillars of about 20 ft in diameter, and spaced about 35 ft apart.

It soon became evident that the ramp on rubber was a versatile machine. It was good in drifting and was a good loader in the stopes. Of course weaknesses developed that called for some redesign and some changes in operating methods.

First, let us examine briefly the machine and then the method of using it. Essentially it is a slide ramp mounted on a Joy drillmobile chassis. The chassis has four wheels with 8.25 by 15 rock lug tires. Two 10-hp electric motors with speed reducers provide the power for the four-wheel chain drive. A two-hp hydraulic pump activates two sets of hydraulic jacks, one set to raise or lower the rear end of the slide ramp, and the other set to raise or lower the three-drum hoist mounted near the front of the ramp. This slide is made of ¾-in. steel plate with 15-in. channel iron sides. Wearing strips are welded on to the bottom. In regular operating position, the front 6 ft 8 in. of the slide is on a 26° slope from horizontal. The next 7 ft 4 in. section is 13° and the last 14-ft section is 6°. The front 20-ft of the slide is six ft wide, and the last eight ft tapers to 9½ in. at the end and has no bottom—merely serving as an anchor for the pull rope sheave.

The 30-hp electric 3-drum hoist is mounted four ft over the front of the slide on a steel plate hinged at the back to a supporting superstructure of heavy angle iron. At the front, the plate is attached to two hydraulic jacks which allow the hoist to be raised or lowered, depending on the height of the ground in which it is operating.

In operation, the conventional hook-up of a three-drum hoist is used with two tail ropes going from the rear of scraper over sheaves attached to the wall of the stope, while the pull rope off the center drum goes back to the tail of the ramp.

The scraper is a 54 in. wide semi-box type of our own St. Joe design, that holds about nine tenths of a ton of ore. A ⅝-in. steel, 6 by 19 rope is used over ten-in. sheaves. The overall length of the ramp is 28 ft 2 in. and height is 8 ft 9 in. The width at widest part is 7 ft 6 in. The operator stands at either side of the ramp, using remote controlled air-operated clutches.

The machine will travel under its own power at the rate of one mph and move up grades as steep as 20 percent. For long moves, it can be towed by a truck.

Now, after nearly three years of operation in drifting and loading of ore, certain conclusions can be drawn. Loading can be done at the rate of three tons per minute. An operator can load up to 600 tons per shift, under ideal conditions, depending upon truck or shuttle car service, size and condition of rock pile. Maintenance, at first too high, has gradually been

---

A graduate of the University of Minnesota, Elmer A. Jones has spent two years at Ducktown, Tenn., in copper mining, and 30 years at Bonne Terre, Mo., for St. Joseph Lead Co. He has served as mine surveyor, mine superintendent, and assistant division superintendent. Since 1953 he has been division manager of the Southeast Missouri Mining & Milling Division. The operation produces about 100,000 tons of lead metal per year.

Built to St. Joe's specifications, this six-ton diesel truck measures 6 ft 6 in. wide, 4 ft 6 in. high and 18 ft 6 in. long

brought down by various refinements and improvements to 11½ cents per ton, which compares quite favorably with that of the St. Joe shovel.

At this point it should be emphasized that constant study of a loading problem and a continuing review of detailed costs will eventually pay off in more efficient work and lower costs, both in operation and in maintenance. As an example, when it became evident that more brake bands were being used on the hoist than seemed necessary and breakage of ropes was too high, studies were made to find out what was wrong. The pay-off came when the size of the cylinder operating the brakes and clutches was reduced from 2½ in. diameter to 2 in. The cost of brake drum replacement and ropes immediately showed an improvement, with operating results just as efficient. Other such minor changes have been made, all having a cumulative effect in reducing maintenance costs.

Diesel-Truck Haulage

Now let us take up the subject of haulage. A loading machine is useful only when loading or cleaning up, so the rock has to be moved fast to keep the loader working. Inasmuch as our loader was rubber tired, haulage must be of the trackless type. Our first thought was the shuttle car, a very successful unit in the Lead Belt. Therefore, a 60E 12-ton Joy shuttle car was bought for each loader. This combination of slide ramp loading into a 12-ton shuttle car was very efficient for the relatively short-haul work around the shaft. But when distances got up to 1000 ft and the main line trolley operation soon appeared to be a bottleneck, management knew it had to have a haulage unit that was faster and that was not tied to a trolley wire or a trailing cable.

Here, then, was the problem presented to management. Hauling efficiency was due to decline as distances to the shaft increased. The mine must have a faster unit that, it was hoped, would be of lower initial cost, cheaper to maintain, and more versatile and flexible.

In the Lead Belt, our engineers had investigated diesel-truck haulage and run into the problems posed by the size of standard trucks. They were too high to go through our drifts, or too wide, or loading height was too high. So St. Joe had designed its own truck to fit its particular conditions. After building a first model for experimental work and then two others for real trial, management felt it had a practical and cheap haulage unit. This truck is 6 ft 6 in. wide, 4 ft 6 in. high, and 18 ft 6 in. long, with a bed capacity of 6 tons or 135 cu ft. The engine is a 2-71 series General Motors diesel with a twin-disc fluid clutch and Cotta transmission. The truck will negotiate a 12 percent grade and have a top speed on level road of 26 mph. Dual wheels are mounted on the rear with 12-ply, 7.50 x 15 tires on all wheels, front and rear. Standard truck springs, with overloads and radius arms, are mounted on the rear. Two 6 in. hydraulic cylinders, pivoted inside the frame, furnish the power for dumping the bed. Heavy-duty air brakes are supplied to rear wheels only.

Two of these trucks were built to our specifications by a shop in St. Louis and put into use at Indian Creek. Time studies were made to check performance of the trucks and of the shuttle cars. Various combinations of hauling equipment and various hauling distances were studied.

In order to maintain a daily production of 2000 tons by a two-shift operation of four loading units, each unit must produce an average of 250 tons per shift. Studies indicated that a loading unit located 1000 ft from the shaft could obtain the required production either by using a 12-ton shuttle car or one 6-ton truck at approximately the same cost, 17 cents per ton. At 2000 ft, two shuttle cars could get the required tonnage at a cost of 25 cents per ton, but two 6-ton trucks could do the job at 23 cents per ton and haul up to 2500 ft.

These figures are based on our own actual performance. By projecting them up to greater distances, it was possible to determine costs when using either the shuttle car or the six-ton truck, and then to figure when it would be necessary to go to a 10 or 12-ton truck. Therefore, the mine is now starting to get larger trucks for hauls up to 4000 feet in order to keep hauling cost down to 25 cents per ton.

Loading and Hauling Cycle

A typical cycle of loading and hauling of ore from a stope begins with the preparation of the rock pile by a D-4 caterpillar bulldozer. All fly rock from blasting—both primary and secondary—is bulldozed into the main rock pile, and the roads into the stope are cleaned. The ramp is moved in close to the rock pile, the back end is raised hydraulically, and the hoist raised to its proper position. Sheaves are anchored in the stope walls, and ropes placed around them. An air hose is attached to the activating cylinders, and the ramp is ready to load. Trucks or shuttle cars are placed under the ramp, and hauling is soon under way to the skip pocket.

The main haulageway is 11 ft high by 24 ft wide so that two-way traffic can be maintained. The drifts off

An operator can load up to 600 tons per shift with a slide ramp

the main line to the nearby stopes are 11 by 14 ft wide. Crushed rock brought down from the surface is used as a cover for the roads, which are regularly maintained by a diesel motor grader. Water dripping from the back or out of the trucks is a constant problem for good road maintenance. Ditches and cross culverts are provided to keep the water off the road-bed as much as possible.

Lubrication and repair of all loading and hauling equipment is done by a regular crew of maintenance men. An underground shop with concrete floors, bridge crane, grease pit, welding shop, supply house and tool room, is a necessity for good maintenance.

It should be emphasized again that a constant study of efficiency and costs will point out that, as conditions change, various remedies must be used to keep pace with rising costs.

In its own operating experience, the Indian Creek mine has recognized the necessity of changing its hauling equipment from the shuttle car to the faster diesel truck. The loading unit had to be improved and so was redesigned. The necessity of lowering maintenance on haulage equipment required the surfacing of roads, and the investment in a motor grader. Lower maintenance costs on all equipment dictated the building and equipping of a modern underground shop. Other changes have come in the use of the new 630 Eimco in development work, because it could do the job better than the ramp. Each year the mine operates, other changes in methods or equipment may be expected.

Operating Costs—$0.439/Ton

The Indian Creek Mine is now being operated at the rate of 2000 tons per day, using four loading ramps in operation, and two Eimco 630 air shovels in development, all loading into one diesel-electric 12-ton shuttle car, one electric cable 12-ton shuttle car, and six 6-ton diesel trucks. Two 10-ton diesel trucks are on order, to take care of longer hauls which will eliminate the cable-reel shuttle car. Other equipment includes an Allis-Chalmers diesel motor road grader and a D-4 caterpillar tractor converted to a bulldozer. Operating costs during 1956 show loading $0.216 per ton, and hauling $0.223 per ton, for a total of $0.439 per ton.

To conclude, mechanized mining is not a static or stagnant thing; it must progress and become more efficient all the time. Better loading and hauling equipment will continue to come to the miner only as long as he can give ideas to the manufacturer and help him to develop the new machines he needs. Remember that the mining machinery companies have no mines and can only develop new machines in conjunction with the miner. Another point that should be noted is this: good and efficient equipment in one mine is not necessarily good in another, due to so many varying conditions. Don't go overboard on a new machine or piece of equipment until you try it pretty thoroughly in your own mine. It might not stand up or be what you had hoped for. It's unlikely that a universal loader will ever be found that will do a good job under all kinds of conditions. Mining is a highly specialized business.

EFFECTS OF COAL IMPORTS

(*Continued from page* 49)

EUROPEAN COAL PRODUCTION
(In Millions of Metric Tons)

Country*	1937	1954	1955	1956
Belgium	29.9	29.2	30.0	29.6
Czechoslovakia	16.8	21.6	22.1	23.5
France	44.3	54.4	55.3	55.1
Saar	13.4	16.8	17.3	17.1
West Germany	137.6†	128.0	130.7	134.4
The Netherlands	14.3	12.1	11.9	11.9
Poland	66.0‡	91.6	94.5	96.0
Britain	244.3	227.9	225.2	225.6
Other European lands excluding Russia	12.9	28.2	28.5	28.9
Europe total (excluding Russia)	579.5	609.8	615.5	622.1
Russia (including brown coal)	127.0	346.0	391.0	429.0

* Source of statistics: German Federal Government.
† Includes entire area of prewar Germany.
‡ Includes only area of postwar Poland.

ECSC COAL INDUSTRY INVESTMENT PROGRAM IN MILLIONS OF DOLLARS
(West Germany's Share Appears in Parentheses)

Item	1954	1955	1956	1957
Shaft construction	241.79 (96.39)	249.36 (102.93)	281.32 (118.66)	240.73 (101.16)
Mine coking plants	67.85 (33.99)	51.58 (25.14)	62.04 (31.61)	59.13 (32.67)
Independent coking plants	19.49 (....)	12.29 (....)	11.60 (....)	5.60 (....)
Briquette plants	3.85 (0.90)	6.95 (2.31)	8.63 (1.64)	6.19 (0.78)
Mine power plants	111.73 (64.68)	83.52 (46.20)	110.02 (50.42)	145.21 (62.20)
Totals	444.71 (195.96)	403.70 (176.58)	473.61 (202.33)	456.86 (196.81)

dependence on imported goal will grow proportionate to its increased consumption of energy.

A United Nations economic bulletin issued at Geneva forecasts that total Western European coal imports from the United States will increase to 50,000,000 tons by 1975. The result, concluded the UN bulletin, will be soaring freight rates unless shipping tonnage is expanded proportionately.

For example, UN economists point out that a rise in American coal shipments to 50,000,000 tons would require nearly 2,000,000 deadweight tons of additional shipping. Thus, shipping, as Schlieker points out, is the cornerstone of the American coal trade with Europe: the availability of shipping determines freight rates, and freight rates, in turn, stimulate or depress Europe's capacity to buy American coal.

All this sounds elementary, but the fact is frequently overlooked that a world shipping shortage exists, and is becoming ever more acute.

In Europe, however, the outlook is that the shipping shortage is a short-range problem which will be overcome. The Organization for European Economic Cooperation made a study recently which concluded:

"Europe's rising need for American coal will not be materially affected by the present shipping shortage.

"After making allowances for all possible contingencies, it was decided, on the strength of available information, that the reactivation of ships from the United States reserve fleet, together with the heavy new tramp-building programs, justified the assumption that any increase in coal imports could be covered satisfactorily without dislocation of the freight market.

"In fact, it appeared reasonable to expect that the present falling trend in freight rates was likely to continue."

A Day and Night Difference!

NEW Femco MINE-LITE* SYSTEMS

Now—Femco makes the finest fluorescent lighting systems for underground efficiency

SEE a day and night difference in working conditions! Here is portable area lighting ready now for men who mine.

SEE a day and night difference in design features! Famous Femco engineering has scored again with a superior product.

SEE a day and night difference in maintenance! Top up, old lamp out, new lamp in, no fuse to change. Sealed-in ballast is guaranteed.

Get the facts—ask for data

SAFE AND SURE Permissible systems have U. S. Bureau of Mines approval for gassy atmospheres up to the working face.

DESIGNED RIGHT Extra rugged lamp unit weighs only 12 lbs. Exclusive sealed-in Femco ballast is in the base for ease of standing.

EASY TO USE Systems are completely portable. Forty lamps use only 10 amperes. 230 Volt power source permits long cables.

Distributed by:

NATIONAL MINE SERVICE CO., 564 ALCOA BUILDING, PITTSBURGH 19, PA.

Division plants: Beckley, W. Va., Logan, W. Va., Morgantown, W.Va., Indiana, Pa., Forty Fort, Pa., Ashland, Ky., Jenkins, Ky., and Madisonville, Ky.

INDUSTRIAL PHYSICS & ELECTRONICS CO., SALT LAKE CITY, UTAH

MANUFACTURED BY

Femco, Inc.

IRWIN, PENNSYLVANIA

UNderhill 3-3200

Makers of the famous Femco Trolleyphone

WATER CLARIFICATION At ROBENA CLEANING PLANT

. . . is an example of what can be done by the coal industry in its never-ending fight to abate stream pollution

By PAUL L. RICHARDS and JOHN C. DURFEE

Respectively
Manager, Coal Preparation, Coal Division
and
Superintendent, Robena Cleaning Plant
U. S. Steel Corp.

IN recent years the coal industry has joined with other industries and with state regulatory commissions in the study of necessary controls of industrial wastes discharged into the nation's streams. The United States Steel Corp. has been a party to these studies, and the installation at the Robena coal preparation plant is an example of what can be done by industry toward abatement of the stream pollution problem.

The Robena plant was constructed in 1948 and is located in Greene County, Pa., on the Monongahela River. The raw coal cleaned is produced by the three mines in the Robena group. Twenty thousand tons of prepared high volatile coal are shipped daily in river barges to the Clairton Works of United States Steel for carbonization into metallurgical coke.

Design capacity of the Robena plant was originally 600 tph, and later expanded to 800 tph during the first six months of operation.

There is no need to mention the many and varied factors in modern coal mining which combine to create the problem of washery water clarification. The needs of our plants vary from one district to another, but one or more of the following must be accomplished in any wet cleaning plant:

1. Water clarification to improve efficiency of cleaning.

2. Removal of solids from washery waters to improve recovery.

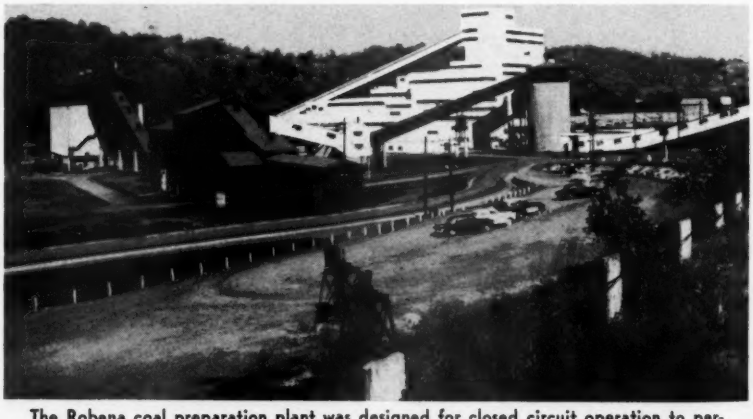
3. Conservation of water for re-use.

4. Clarification of effluent water to prevent stream pollution.

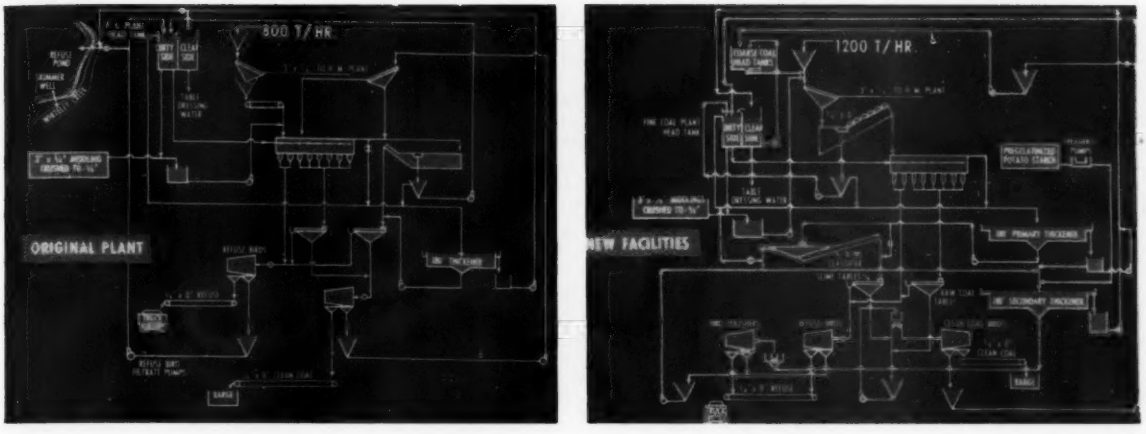
The Robena plant was designed for closed circuit operation to permit maximum recovery of usable coal and to prevent stream pollution. Coal finer than 1/4 in. was classified at 28 mesh. The coarser fraction was tabled directly. The minus 28 mesh was thickened in a 180 ft diameter thickener and then tabled. The combined clean coal was mechanically dewatered in solid bowl centrifuges. Thickener overflow and centrifugal filter effluents were returned to the plant circuit for re-use. Extreme care was exercised to reduce the demand for make-up to insure that no plant bleed-off would be required.

It was soon found that the quantity of sliming material which would be produced had been underestimated; there was a substantial load of recirculating solids. As this load grew, it became necessary to bleed-off some slime-laden water to prevent the solids in re-circulating water from building up to a degree which would have made operation impossible. Fortunately a spill pond of generous proportions had been built and this was put into service as a regular settling basin.

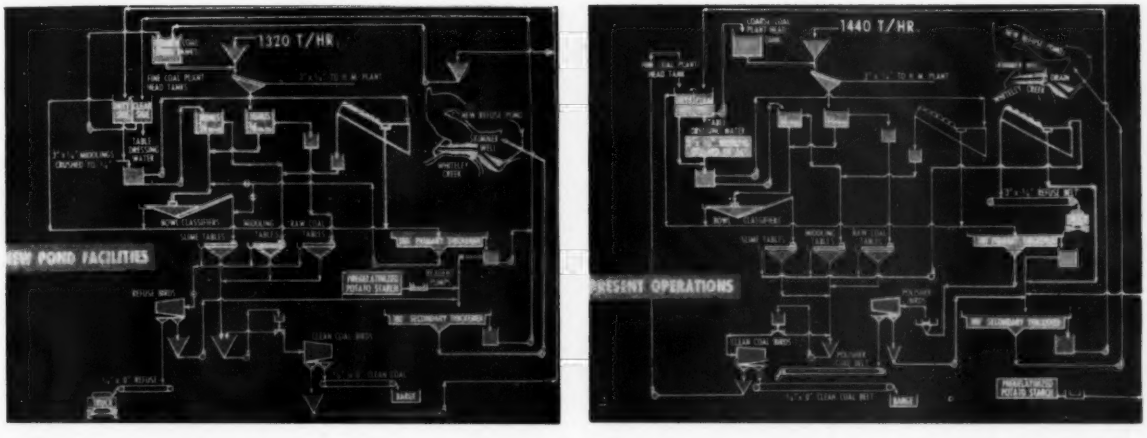
In 1951 plans for the expansion of capacity to 1200 tph were completed. Changes in the original water circuit were included in the program. The new facility included an additional 180 ft diameter thickener where the overflow of the primary thickener would be flocculated. The flocculated underflow was pumped to bowl centrifuges for dewatering. This cake was included with coarser plant refuse. Bowl classifiers for desliming the original table feed were also in-



The Robena coal preparation plant was designed for closed circuit operation to permit maximum recovery of usable coal and to prevent stream pollution



Flowsheets of Robena plant showing the several stages of developing the water circuit



cluded. The overflow of these units was fed to the primary thickener. Effluent from the solid bowl filters dewatering clean coal was returned to the head of the plant for wet screening of raw coal.

Flocculation and Settling Pond

It is interesting to note that in selecting a flocculating agent, it was necessary to consider the possible effect on the heavy media units in which the plus 1/4-in. coal is prepared. A build-up in the plant water of any reagent which would cause the magnetite to flocculate could not be tolerated. Starch with or without lime additions was found to be satisfactory. Lime additions were needed, however, to insure entirely clean flocculator overflows. Pre-gelatinized starch was the final selection. This starch is higher in price but its nature permits its use in automatic mixing equipment. No labor is required beyond periodic replenishing of the feeder hopper.

Our tests indicated that flocculation is not truly effective where solids in the slurry are in excess of five percent, and do not work at all where solids exceed eight percent. These limits apply at Robena and do not necessarily fit another problem, though there is undoubtedly a limiting range for any coal plant. To cover this problem, it was necessary to provide that make-up water and a portion of the clarified water should dilute the feed to the flocculator to the desired degree.

This new water circuit developed new problems. The slime cake from the new high speed centrifuges could be handled on a belt without difficulty. However, the material was sufficiently dewatered so that it could be called water hungry. As a result, when mixed with coarser refuse which had been dewatered over screens, the slime cake picked up enough water to make the entire refuse product difficult to handle in the trucks provided for the purpose.

To help solve the problem, additional adjacent acreage was purchased, including a stream valley with relatively high hills on either side. By diverting and straightening the creek channel, it was possible to dam up sufficient area for long-range disposal of fine refuse slimes. This construction was the alternate to the purchase of special trucking and disposal equipment which would have been necessary.

As mentioned earlier, the expansion of the plant to 1200 tph included bowl classifiers for desliming table feed. It became necessary to recycle portions of the 180-ft thickener underflow to permit maximum coal recovery. The effect here was to increase the grain size of the overflow of these units and further build-up the re-circulating load. In an effort to cut down on water flows, the hydraulic classifiers ahead of the table circuit were discontinued. Some relief was experienced and the raw coal capacity of the plant increased to 1320 tph.

In this change, two of the Akins spiral rake classifiers became available for a new use. Table refuse had been dewatered in solid bowl filters from the beginning. A change was now made to a flow sheet which included the use of the Akins units for dewatering by desliming of table refuse, with the overflow of these units flowing directly to the flocculator.

To further improve plant operation, it was found that the high speed bowl centrifuges which had been installed for refuse dewatering, could be put to use in dewatering the underflow of the primary 180-ft thickener. This change nearly eliminated the recirculation of solids in the plant.

Maximum Recovery of Fine Sizes

Maximum recovery of fine mesh coal is now possible. Most of the plant water is re-used after virtually complete clarification. Coarser refuse is trucked away. Minus 28 mesh refuse is pumped to the pond after flocculation in the new thickener.

Four hundred seventy gpm of refuse slurry is pumped to the waste pond. This slurry contains 30 percent of high ash solids. Overflow from the pond returns to Whiteley Creek which empties into the Monongahela River. This overflow is clear and has a pH of 7.5 or a little higher. In times of high river levels, the overflow is returned to the plant for re-use as it is clearer than the river water.

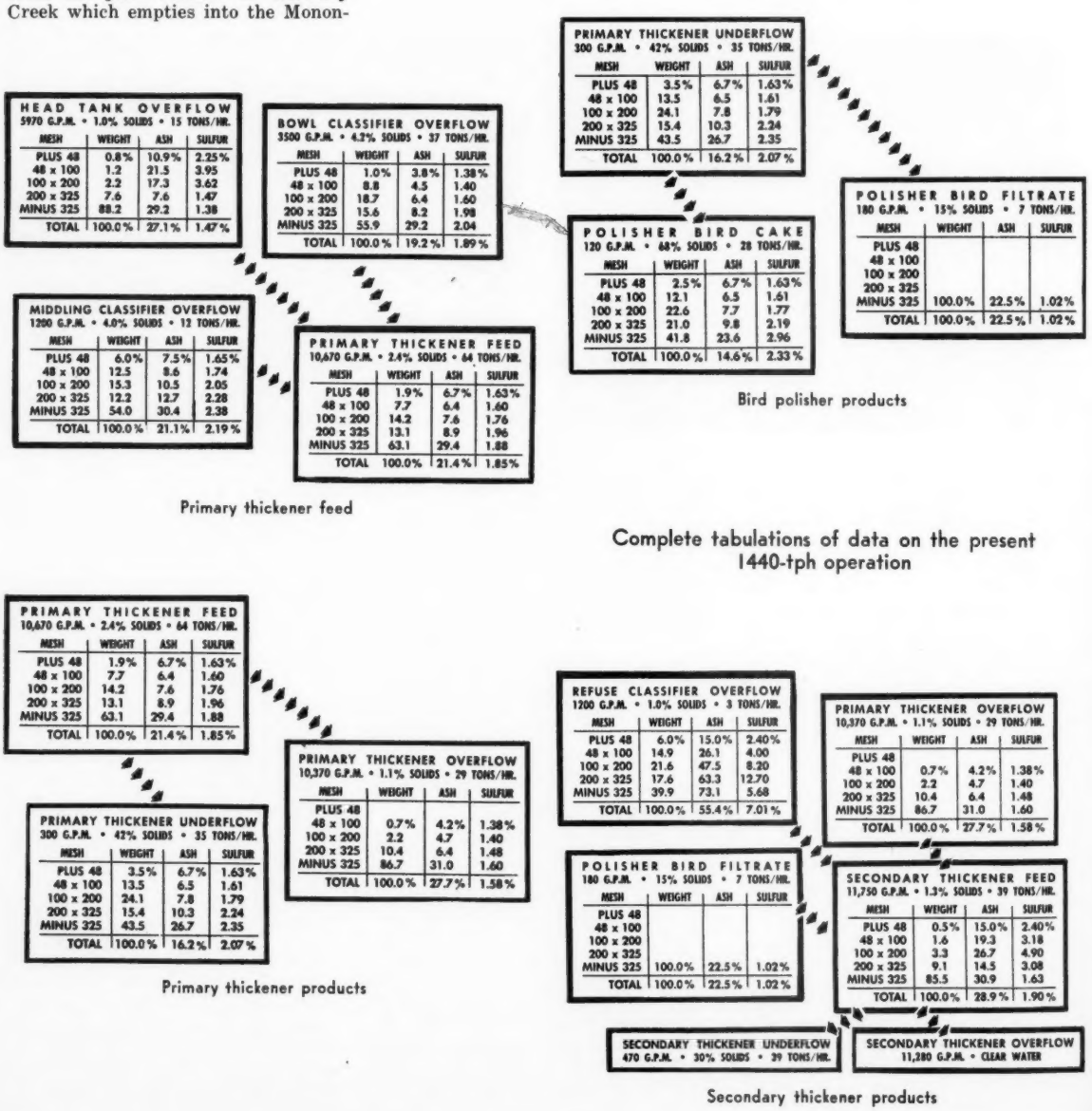
The present operation of the plant permits an operating rate of 1440 tph. Moisture of the finished product has been reduced to its present level of 7.0 percent total moisture or lower.

Management is not entirely satisfied with the ash of the product now recovered in the high speed bowl filters. This material has been cleaned by desliming only. With the cooperation of the Research and Development Department, Robena is preparing a test "Convertol" unit for cleaning of this portion of the product.

The present Robena water circuit has been developed by engineering planning, as well as evolution where management has had to learn the hard way. Complete tabulations of data on the present operations are shown on the accompanying tables.

Robena has more than kept pace however with the impact of increasing use of continuous mining without any loss of yield or quality, and is producing lower moistures than ever before. Operating costs are also somewhat lower in face of many factors which tend to increase costs.

The continuing effort toward a sound water circuit has paid off in many ways, including a contribution to cleaner streams.



Complete tabulations of data on the present 1440-tph operation

Effect of Changes In Drilling and Blasting Practices At Hillsville Limestone Quarry

When management set out to cut costs at this quarry, they made a systematic study of drilling and blasting practices and found that increasing the blast hole size and expanding the drill pattern improved fragmentation. These changes were coupled with the use of self-propelled power-feed drills, sectional drill steel and portable air compressors

By JOHN C. VONDERAU
Quarry Foreman
Hillsville Limestone Quarry
Michigan Limestone Division
United States Steel Corp.

HILLSVILLE quarry of the Michigan Limestone Division, United States Steel Corp., is located close to the Ohio-Pennsylvania line, about ten miles west of New Castle, Pa., and ten miles southeast of Youngstown, Ohio. At this quarry approximately two million tons, annually, of high-calcium limestone is removed from the Van Port vein, and shipped principally to blast furnaces, open hearth furnaces, and cement plants in the Pittsburgh-Youngstown District.

The Van Port vein of limestone averages 22 ft thick in present working areas, and lies almost flat, with a fairly smooth top surface. Overburden, varying in height from 25 to 120 ft at Hillsville, consists mostly of shale and clay with some beds of sandstone, and a vein of coal lying 30 to 40 ft above the limestone.

Prior to recent changes in equipment and procedures, the primary drilling of the limestone was done with six gravity-feed wagon drills, using forged drill steel sharpened for holes bottoming at 1⅝ in. diameter to permit the use of 1½ in. diameter dynamite. All blast holes were drilled to the bottom of the limestone.

A normal blast consisted of 90 holes in a staggered pattern having three ft of burden and ten ft of spacing. This series was loaded with 1½ in. by 8 in. 60 percent ammonia dynamite, using 60 percent standard gelatin primers and detonated with No. 1 and No. 4 millisecond delay caps. The number of blocks requiring secondary drilling and blasting usually averaged about 100. The normal drilling crew consisted of six men operating the wagon drills and four men operating block drills. Air supply for the drills was furnished from a central compressor station with air distributed by six-in. pipe lines extending along the quarry faces approximately 1½ miles.

Drilling Pattern Expanded

In order to decrease drilling and blasting costs and improve stone breakage, experiments were begun in 1955 to increase blast hole diameter and spacing. Holes were increased to 2¼ in. diameter and pattern to five ft of burden with ten ft of spacing. A 30 percent cost savings in dynamite and caps was obtained in these tests and a marked improvement in breakage was noted. The number of blocks requiring secondary drilling and blasting was reduced to about ten per blast.

Subsequent experiments expanded the pattern to 5 ft by 11 ft and 2½ in. diameter holes with results varying according to the stone formation in the particular area being blasted. After several months of trial, it was found that a 2½ in. hole size was optimum and good results could be obtained from patterns varying from 5 ft by 10 ft to 5 ft by 12 ft, depending upon the formation being blasted. During the course of these tests it was found that further cost savings could be realized with the larger holes by use of lower strength dynamite in softer layers of the formation.

Self-Propelled Drills and Portable Compressors

Having proved that the use of larger diameter dynamite and the

expanded drilling pattern resulted in lower blasting costs and improved stone breakage, management took another look at its drilling and blasting methods with the objective of further improving both methods and equipment, if the necessary expenditures could be justified by an appropriate cost reduction.

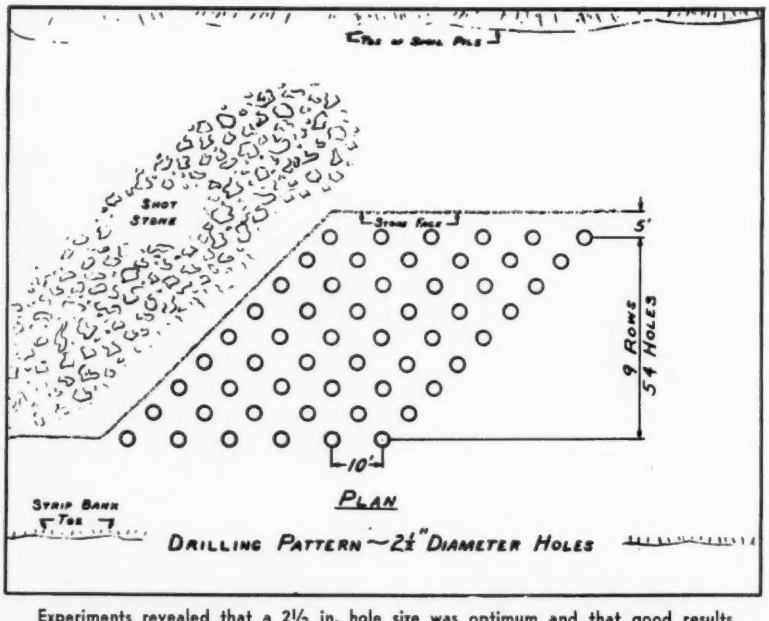
With this in view, a self-propelled power-feed drill was put in operation on a trial basis.

Sectional drill steel and detachable bits were used with the unit. These had been employed previously only on an experimental basis. The larger diameter air hole in the sectional drill steel and rubber-sealed air tube in the shank resulted in a greater air volume at the bottom of the hole, compared to the previous method. This improved the cleaning of cuttings from the hole while it was being drilled, thus permitting the bit to strike more solidly the surface of the unbroken stone at the bottom of the hole. Drilling speed was increased substantially and the effective cleaning of the holes eliminated the necessity of blasters blowing out the holes before loading them with dynamite. Studies indicated that, based on the new pattern, four self-propelled power-feed drills using sectional steel, carbide insert bits, and several shop-made accessories to facilitate the handling of the steel, could drill the equivalent tonnage of six drills of the type previously used, and the primary drilling crew could be reduced from six men to four, the secondary drilling crew from four men to two, and a drill sharpener and helper could be discontinued in the drill shop —a decrease of six men.

Self-propelled power-feed drills helped to cut costs by allowing a reduction in the size of drilling crews

The next change focussed on the elimination of the 6-in. pipe line used to supply air from the central compressor station to the quarry face. The two stationary compressors were attended by one man; in addition, many man-hours of labor were used for repeatedly advancing and extending the line as the quarry face retreated further from the compressors. This line was located on top of the stone near the edge of the face and hindered the movement of overburden stripping equipment. Cost studies indicated that savings could be obtained by the use of portable compressors which would be located in the quarry near the drills.

The mine therefore purchased two 900 cfm diesel engine driven machines, using one compressor for each pair of drills. These machines also provided sufficient air to operate a block drill from each one.



Experiments revealed that a 2½ in. hole size was optimum and that good results could be obtained from patterns varying from 5 by 10 ft to 5 by 12 ft, depending upon the formation being blasted

Cost Savings and Improvements

In summary, management has accomplished the following cost savings and improvements.

With the application of 2½ in. diameter blast holes, corresponding increase in dynamite size, expanded drilling pattern, and using self-propelled power-feed drills, it has:

(1) Reduced the primary drilling crew by two men.

(2) Reduced the secondary drilling crew by two men.

(3) Reduced by two units the number of primary drills necessary to operate and maintain.

(4) Reduced by 26 percent the primary dynamite cost per ton of stone blasted.

(5) Reduced by 53 percent the electric blasting cap cost per ton of stone blasted.

(6) Reduced by 50 percent the secondary drilling and blasting costs.

(7) Improved stone breakage, resulting in better loading conditions for the shovels and fewer primary crusher delays caused by large blocks.

By use of sectional drill steel and carbide insert bits, it has:

(1) Discontinued two men in the drill steel forge shop.

(2) Improved handling of drill steel at the drill by use of drill racks and an air hoist.

(3) Reduced blasters' time required for loading of dynamite by producing clean, standard-diameter drill holes.

By use of portable compressor, it has:

(1) Discontinued the position of compressor attendant.

(2) Reduced labor which was previously necessary to move and extend a 6-in. air line.

(3) Improved conditions for movement of equipment on top of the stone by elimination of the 6-in. air line.

Use of portable compressor reduced labor which was previously necessary to move and extend a six-in. air line

As beneficial as these changes have proved to be, Hillsville quarry is still constantly looking for further cost savings in this high-cost phase of quarry operations—drilling and blasting. Its studies in this direction are currently taking the form of trials in the field of fertilizer-grade chemicals as blasting agents.

MECHANICAL MINING

(*Continued from page* 41)

proved the quality of the product delivered to the power plant.

More trouble than expected has been encountered from the large boulders or iron pyrites imbedded in the seam. In some instances these boulders have reached a maximum size of 18 in. in diameter and 6 ft in length, and it is impossible for the "Mol" to penetrate them. Provision has been made for an electric drill and permissible powder to be kept in the panel and used for the purpose of removing these boulders when they are encountered. They are far more numerous than anticipated due to the fact that they were shot down with the coal in regular blasting methods, and since they were covered with coal, it was impossible to detect them while being loaded with conventional loading machines.

The size consist of the coal produced by the Colmol unit is not important at this operation since the entire production is broken down to 1¼ in. by 0. In fact, the 4 in. by 0 coal being produced by this unit is beneficial to the operation. However, one size analysis was taken, the results of which are as follows:

4" x 1¼"	32.6%
1¼" x ⅜"	27.5%
⅜" x 0"	39.9%
	100.0%

The coal is very woody in structure; hence these results probably would not be comparable to results obtained in other seams.

The bit cost of the Colmol has been quite surprising. The average bit cost on cutting machines for the month of March was $0.088 per ton, while the average cost on the Colmol was $0.121 per ton. This cost can be improved as the operating crew becomes more experienced in locating and dodging the boulders.

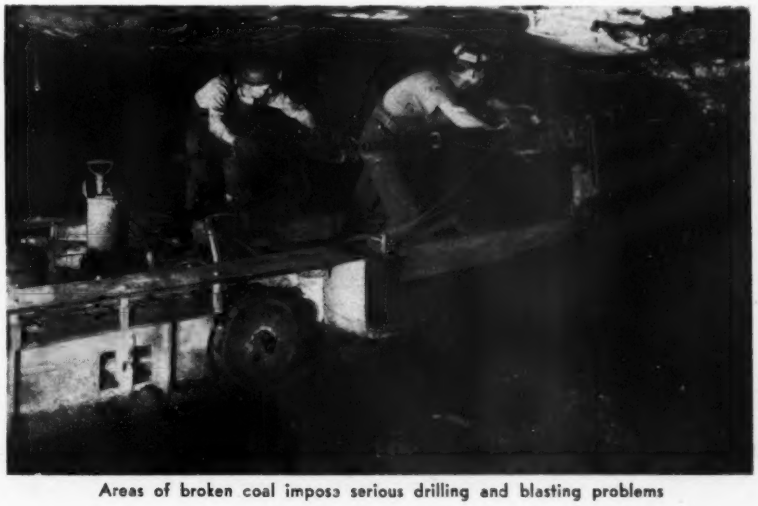
The area in which the Colmol is operating is a section of the mine under which the No. III seam has been extracted. This area was selected to determine whether or not roof conditions would affect the Colmol as they do conventional units. The roof in this section had already begun to get bad when the Colmol was installed; however, there has been no further trouble, indicating that conventional blasting methods are directly responsible for the bad roof conditions encountered in the conventional mining sections.

Conclusion

The Viking mine has not had enough experience yet with this type of mining to be able to answer all the questions, but it does know that this new method of mining has so many advantages over the old method in production records and cost that it is filling a very important need of the industry.

All the problems have not been solved yet, and there may be seams of coal which are not minable with the present available equipment, but these problems are being solved one by one with the cooperation of the manufacturer and mining men.

It is the author's hope that the Viking mine can be progressively minded enough to advance with this trend and not fall by the wayside, as many will do when they find they cannot compete with modern methods of mining and equipment only because they failed to modernize.



Areas of broken coal impose serious drilling and blasting problems

The coal industry has shown unusual interest in a device that allows a belt to make a right angle turn. The possible effect of such a unit is indeed great when one considers what it may mean in added flexibility for conveyor haulage behind continuous mining machines. Development and present application of the belt turning device are fully covered in this report

By WM. G. KEGEL
Asst. Gen. Master Mechanic
Vesta-Shannopin Coal Div.
J & L Steel Corp.

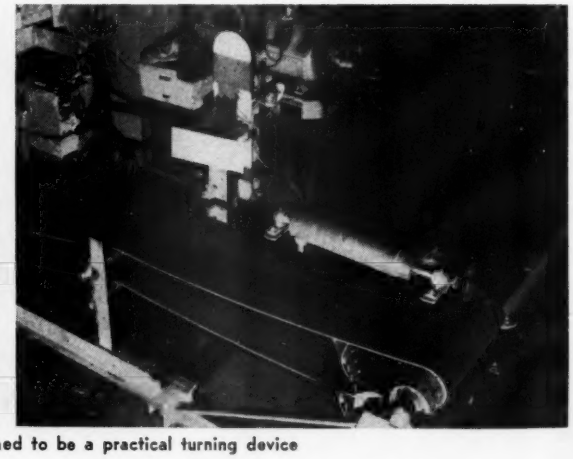
SERVICE HAULAGE FOR CONTINUOUS MINING WITH BELT TURNING DEVICE

WITH the advent of the continuous mining machine in 1949, the coal industry felt that it had acquired another high production tool for use in the constant effort to reduce labor and maintenance costs. The ensuing several years witnessed the interest in, and purchase of, a large number of these machines.

Close study of the operation of the continuous miner indicates that while the machine has a very high potential capacity, the output has been limited by the transportation systems used behind the machines. In a great many operations the available equipment on hand, such as loading machines and shuttle cars, was pressed into service, while in other operations, the entire complement of haulage equipment was purchased; however, there still remained considerable shortcomings in all systems to transport the coal from the face. Much thought was given this problem by operating personnel and manufacturers, and considerable research was made by various agencies, in the hope that some system would be evolved which would make the continuous mining machine a part of a truly continuous mining operation.

Extensible Belt for Continuous Haulage

The extensible belt is one unit which has proved itself and has been the means of lowering delay time in continuous mining. Belt conveyors



From shop trials evolved what seemed to be a practical turning device

are held in high regard by operating men, because of their ability to convey material efficiently. Relatively low horsepower input is required for this transportation system because a minimum of friction is involved. With a system employing only belt transportation, some rail haulage and shuttle car hazards are eliminated, which, from a safety standpoint, is very desirable.

Another factor strongly influencing the thinking relative to belt conveyors has been the recent developments in belt manufacture which is resulting in much stronger and lighter belts. By the end of the year 1956, there were approximately 100 extensible belt units in operation, which indicates the intense interest of operating companies in any piece of equipment which will tend to increase production and lower costs.

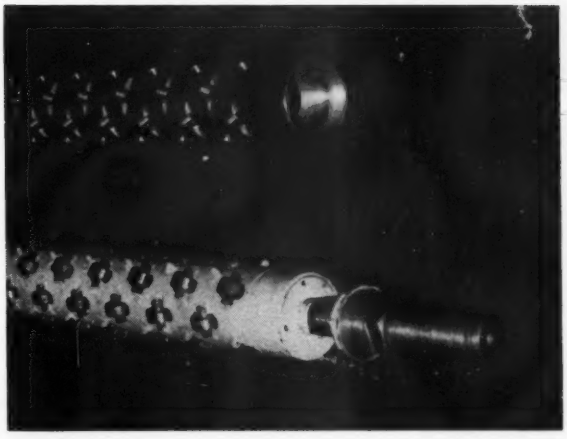
The extensible belt has a definite application in room work where total extraction is not practiced. It has a place in entry development, where it aids in the elimination of delays in operating time and the lowering of labor costs for the installation of loading points. When total extraction is practiced, and because of shallow cover the size of the pillar can be kept small, the extensible belt has also found application.

Advantages of a Belt Turning Device

Since belt haulage is a preferred method, if the belt could be made to make a right angle (90°) turn, the possibility of adapting the extensible belt to a complete haulage system without the use of any auxiliary haulage equipment behind the continuous miner would become a reality. The extensible belt could then be used to develop all headings of a group and could also be used in the total extraction of large size pillars. This thinking, relative to extensible belts, instigated the thorough study of belt conveyor systems by the Coal Division of the Jones & Laughlin Steel Corp.

Various systems for making a turn were on record as having been tried or contemplated. One system included bringing the belt into a vertical position, prior to the turn, then swinging it back to the horizontal after the turn had been made; however, some sort of corner by-pass conveyor is needed with this method. Another was the possibility of bringing the belt into a tubular shape before executing the turn. However, all of the known methods presented definite restrictions, particularly as to size and weight of structure and time necessary to set up and move such a device. Discussion led to the belief that there existed the possibility of developing a system which could be considered practical for use in the coal mines. The requirements for such a device are many and at the time seemed insurmountable for the following reasons:

1. The turn structure would have to be light enough for rapid moving from one location to the next as the work advanced.
2. It would have to be rugged enough to withstand the excessive tensions imposed by a belt conveyor of this type.
3. It would have to be small enough in area to permit the movement of supplies around the unit when it is installed in the belt line and also provide the necessary clearance for the travel of operating personnel.
4. The height of the unit would be restricted, because it would have to be low enough to fit into a present belt system.



The small bearings remove the friction which otherwise would cause the belt to creep along the pulley

Problems of a Belt Turning Design

Above all else, a method for turning the belt would have to be devised. Spiralling a belt around a straight pulley set at an angle to the direction of belt travel seemed to be the simplest and most direct way of changing direction, so it was fully investigated. It was found that when a belt is wrapped around a pulley in this manner some definite relationships exist between:

1. The width of the belt.
2. The diameter of the pulley.
3. The angle at which the turn pulley was set with respect to the direction of belt travel.
4. The amount of wrap around or arc of contact.

When a belt is wrapped around a pulley in this manner, it forms a helix. The advance or lead of the helix becomes the prime obstacle to the negotiation of the turn, because it has the effect of forcing the belt to travel along the pulley longitudinally. To nullify this advance or creep, a straight pulley was studded radially, throughout its length, with small prelubricated ball bearings. As the pulley revolves radially about its longitudinal axis, the small bearings roll freely in a direction parallel to the pulley's longitudinal axis.

The small bearings remove the friction which otherwise would cause the belt to creep along the pulley. Tests made with this pulley proved that if the belt were properly directed by snub pulleys to approach the turn pulley at the proper angle, it would track perfectly and execute a turn.

Shop Trials Develop Construction Features

A full size model of the proposed turning device was set up in the shop. From it we were able to learn the proper reeving necessary to train a belt through a 90° turn. Further experimenting dictated a set of corner brackets or pulley mountings, and from this evolved what seemed to be a practical turning device. This first turn was tried out at the Shannopin Mine at Bobtown, Pa., where a 32-in., 4-ply, butt entry belt, running 220 fpm, was in operation. The turn was installed in the butt entry about 300 ft inby the drive, and the belt then turned into a room for a distance of 50 ft. The belt was loaded with coal from a shuttle car, and the coal moved out of the room, through the turn, and was discharged into mine cars in the face entry. The test lasted only four days because it interrupted the sequence of working places farther back in the butt.

One of the most important factors for the proper installation of this turn was demonstrated by this test, namely, the anchoring of the turn unit. It was found necessary to hold the unit securely to the bottom, and four timber jacks were used to accomplish this. The turn also had to be anchored to resist tension from both directions. To accomplish this, Jack pipes were set in the butt entry, two in line with the room run, and two in line with the butt run. Small rope winches, or "come alongs," connected the Jack pipes to the turn and permited adjustment in alignment at the time the turn unit was set in

place. The success of this first test was most encouraging, and plans to adapt the turn to the Joy Extensible Belt were initiated.

Plans Adopted for Underground Installation

In actual mining operation, the turning of a working place at a right angle to the center line of the extensible belt presents a unique problem. Before a turning device can be set, the extensible belt tail piece has to be moved into the newly developed working place far enough to clear the turning device. This requires about 22 ft from the center line of the original heading.

The generally accepted method of using a bridge conveyor will not work because it has only eight ft of telescoping or retractive ability. To provide the necessary space, the tail piece was redesigned to permit the bridge conveyor to move back over the full length of the main body of the tail piece. By using a bridge conveyor 15 ft long, it could be moved back until its inby end was even with the inby bumper of the tail piece.

It was further necessary at this time to uncouple the bridge conveyor from the miner discharge conveyor. This was made practical by installing a roller, mounted near the inby end of the tail piece, on which the bridge conveyor can rest. With this arrangement the tail piece can be pulled in against the rear bumper of the miner. These changes provide a space of 19 ft. The tail piece itself will produce the remainder, because while it is still in the original heading, the pivoted tail pulley permits angling off-center as much as six ft.

The before-mentioned combination of changes permits a turnout to be driven from 45 to 50 ft from the center line of the original heading, then by the contracting of the equipment in the manner outlined above, the necessary space to set up in the new heading is made available.

A complete unit set up at the shop

Upon receiving an extensible belt drive and tail-piece, a complete unit was set up at the shop. First one, and then two turns were put into the belt line. As anticipated, it was found that the extensible feature readily worked through the turn units. It was also possible to simulate turnouts and check on the feasibility of the short bridge conveyor and its ability to permit the making of such turns.

Mine Trials Prove Successful

The combination proving practical in operation, the entire unit was now moved underground. A three-entry projection was laid out near the Richeyville shaft of Vesta No. 4 mine, and for a period of six weeks the unit operated on a one-shift basis, and its value was established. At Vesta No. 4 mine, where the Pittsburgh seam is being mined, six ft of coal along with 12 in. of draw slate is taken on continuous miner sections. Mining is done with a Joy ICM Miner. The slate, primarily because of its size and shape at the time of extraction, is definitely detrimental to belt life. It was necessary to use conventional timbering because the machine was not equipped with roof bolt drills. This, of course, required more time than roof bolting, which we intend to use in the final installation. This section was operated as an experimental unit and indicated the potential of a complete belt haulage system.

The first turning devices were of such design that a separate unit was needed for a right or left turn, and for this reason, two of each were kept on the section. This particular design was found to be too high at its tripper pulley and resulted in some spillage between the turn and tail piece when they were close-coupled. This condition existed for about ten ft after the turn was set. Later, turns were made lower and the tail piece was raised at its discharge end.

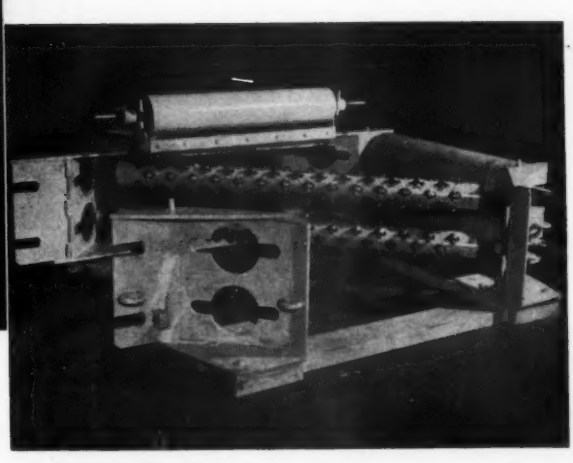
The first turning devices were of such design that a separate unit was needed for a right or left turn

Here's How It Works

The Joy unit being used carries a 30-in. belt which travels 425 fpm. This produces a full trajectory at the trippers and requires a novel spring-loaded splash pan at the transfer point. This spring-loaded pan centers the coal after transfer and does so throughout the range of flow.

In this first unit, an effort was made to standardize on the type and

A four-cornered, reversible turn—rotating the unit 180° and repositioning the pulleys makes either a right or a left-hand turn



size of pulley. (The tripper and snubber are referred to; the angle pulley has been, and is, the same on later units.) The pulleys are 6⅝ in. in diameter. They are not crowned; since the terminal points are not necessarily fixed, crowning was not deemed necessary. The pulleys contain internal ball bearing cartridges. The shafts are stationary, and on the first units, acted as tie rods to space and hold the mounting brackets.

Alignment compensation is made by angling the snubber, or tripper pulley, whichever is at the time acting as a terminal point. Proper alignment naturally requires attention. Prior to the installation of the first turn no trouble is encountered, manipulation of the tail piece easily maintains alignment. The first turn is lined up with the drive unit and centered on the projected room or crosscut. Once set, it requires little or no attention. While the tail piece and the first turn are close coupled, the tail piece operator must follow a new center line at a right angle to the butt entry belt run. Since the turn unit is designed for a 90° change in direction, right angles are mandatory. Quite often the device is more accurate than the man who projects the sightline. Alignment becomes less critical as the distance increases.

The system invokes all the rules of belt operation, and requires strict adherence to these rules. In the more familiar belt conveyor systems, some deviation from procedure is tolerable, particularly when terminal points are far spaced. In this system, each turn establishes a new terminal point, and for some time, short centers are again involved. For this reason the tail piece operator must be responsible for alignment.

Entry Development with the Complete Unit

In December of last year (1956), a complete unit was installed in the Shannopin mine. A projection comprising three entries of the northwest mains was mined with the belt turn system. The right hand entry of this group was used for the belt line, and crosscuts were driven to the left on centers of 100 ft.

The procedure was to drive the right hand entry 100 ft, set a left turn, and mine across to the left hand or outer entry. Here a right turn was set and the left entry advanced 100 ft. The equipment was then pulled back to the center entry, the right turn was reset, and the center entry advanced 100 ft. Again a pull back was effected to the belt entry, which was now advanced 100 ft, and the cycle was then repeated. During this particular operation, it was possible to maintain one loading point while developing three crosscuts and further driving the outside entry 100 ft. When this length was reached, the drive on the extensible belt head piece was using 40 hp.

The power requirement, therefore, limited the possibility of further advance without first moving the loading point. Because of this, the projection was worked out with a loading point advance after the development of each third crosscut. Loop haulage was established in the center and right hand entry. Throughout this and previous trials, the need for a better turn unit was established. During the first two months of the Shannopin operation much experimenting was done with this problem, resulting in the design of a four-cornered, reversible turn. Rotating the unit 180° and repositioning the pulleys makes either a right or a left hand turn, which reduces the investment in a given section and creates less confusion. The overall height of this turn is 28½ in. The design embodies the snubbing principle first used, and found necessary for effective training of the belt.

Some Additional Problems To Be Solved

It might be well to mention at this time some of the problems still existing. Practice produces compromise, and this system is no exception. The units are not as light as might be wished for, a completely assembled unit weighing about 1300 lb. The heaviest part is the 45° pulley which weighs 215 lb.

In an effort to keep the turn low, the various pulleys are small in diameter. This, of course, is not conducive to long belt life. The use of six small pulleys for each turn produces excessive tension and thereby greater horsepower input is needed. The Joy Extensible Belt at present is powered by a 25-hp motor. Our experience indicates a belt line 600 ft long with two turns installed will require 35 or 40 hp. A 50-hp drive would probably make the unit much more practical as far as distance is concerned, and if properly trained and aligned, the belt now used should withstand this drive. However, some compromise on belt life will have to be reached.

The encouraging feature is, of course, the minimum time required for the passage of coal from the face to the mine car. Uninterrupted advances for distances of 50 ft and more are possible, depending on projection and availability of empty mine cars.

Since the conception of the idea of turning the belt, it is felt that extraordinary progress has been made in the development of the belt turning device. The coal industry has shown unusual interest in its development. Future development and the use of the device can be the means of raising production and lowering costs.

OPEN PIT SKIP HOISTING

By RICHARD P. CARDEW
Engineering Representative
National Iron Co.

The skipway track can readily be extended to follow the mining operation as the pit deepens

THERE are now four major methods of hauling materials from within open pit mines to surface. One of the oldest methods, of course, is rail haulage. In addition to skip systems and rail haulage, there are conveyor belt systems and all truck haul systems. Both the conveyor belt and skip systems require the use of some trucks to move material from the shovels to a collecting point.

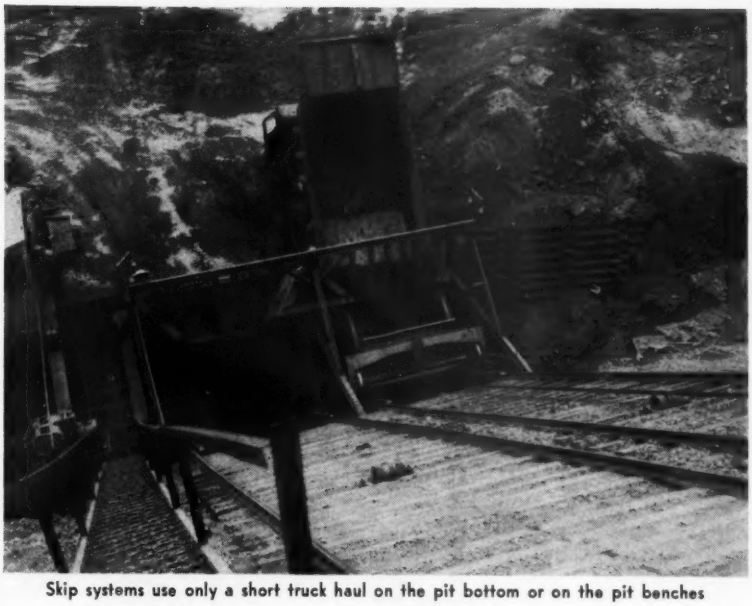
Rail Haulage for Large Area and High Production

Each of these systems has its virtues and drawbacks and each has certain applications to which it is the most suitably adapted. A rail haul system, for example, is best adapted to an operation where a very large or extensive area is to be mined by open pit methods and where extremely large volumes of material are to be handled each day over a long period of time. Rail haulage permits mining either waste or ore at any desired location along the trackway as desired, and material can be loaded directly from the bank into railroad cars.

The drawbacks of rail haulage are that such a system is limited to those mines which have territorial limits and pit room sufficient to allow the benching required for a track grade not to exceed three percent, and thus very long hauls are necessary to bring material out of pits; car switching areas and car storage track are also required. Original investment in equipment is high, and in some types of mining operations track maintenance is high. In a rail haul system a large personnel force is required in train crews, track men, maintenance men, etc.

Trucks Permit Flexibility in Mining

A second pit haulage system is simply trucks. This method is the most commonly used of all pit haulage systems, probably because it permits a great deal of flexibility in mining. Trucks can haul waste or ore at any time and can be readily moved from one location in the pit to another with very little interruption of production. They can readily follow the operation as the pit deepens. Materials do not have to be sized or crushed before loading into trucks.



Skip systems use only a short truck haul on the pit bottom or on the pit benches

Disadvantages of truck haul systems are that economical road grades are about eight percent which requires long hauls, especially from deep pits. Another adverse consideration is that they require a large personnel force and a large investment in standby equipment. Usually one spare truck is required for every four operating trucks.

Truck haul roads must be well maintained, and this is a high cost item. If haul roads are neglected, time and mechanical maintenance costs increase rapidly.

Conveyors Can Usually Be Used at Up to an 18° Grade

The third pit haulage system is a conveyor belt, which elevates the material from at or near the pit bottom to the pit rim. Trucks are used to haul material from the shovels to the screening and crushing plant where the materials are sized for placing on the belt. Only a few trucks are required as they have a relatively short haul at or near the pit bottom.

Conveyor belts are used in many mining operations. They are best suited to pit operations where mining is done at one level for long periods of time so that the screening and crushing plant does not have to be moved very often. Conveyors can usually be used at up to an 18° grade, and therefore the hauling distance is substantially less on a conveyor belt than on a train or truck haul system.

Conveyor systems require less operating personnel than either trains or trucks.

Another advantage of a conveyor system where all material can be conveyed by belt from the pit is that no expensive haul roads need be maintained in the pit. A simple access road is all that is required.

Now let us consider the other side of the conveyor belt picture.

Probably the greatest factor to be considered in the application of belt conveyors, as compared to the other three haulage systems, is the necessity of sizing the material before placing it on the belt. Screening and crushing plants have to be located in the pit areas and the consideration of their location is no easy one. Then too, some consideration must be given to the possibility of having to relocate the screening plant at sometime during the life of the mine.

Conveyors do not adapt to hauling waste and ore on the same belt system simultaneously and they require screening and crushing of the waste in order to handle it on the belt. The crushing of waste material is poor economics in most operations, and therefore where waste is present in the pit, it is usually truck hauled out of pits which use conveyor belts for ore haulage; thus two separate haulage systems usually exist in a so-called conveyor haul pit.

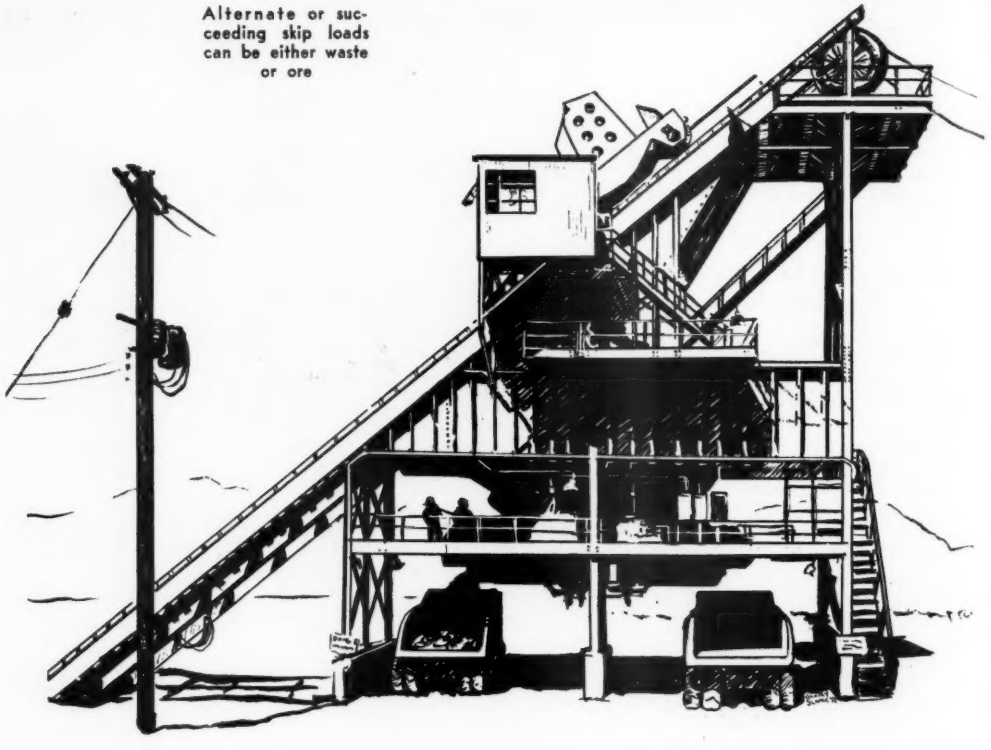
Skip System Provides Shortest Hauling Distance

The fourth and newest open pit haulage method is skip systems, such as the Rockover Skip Systems which are now in common use on Minnesota's Iron Range.

About the Author

Richard P. Cardew was born and raised on Minnesota's Iron Range, and has been close to the mining and mining machinery field continuously.

His experience includes association with a Duluth, Minn., patent attorney. The patent practice included much work on mining machinery, tools and methods. In 1949 he bought the practice and continued it under his own name, as a patent agent, until December 1954. At this time, National Iron Co., who had been a client for several years, engaged him on a full-time basis to continue handling their patent work and also to direct promotion.



This system was developed with the view in mind of combining the desirable qualities and eliminating the drawbacks found in the conveyor, truck or rail haul systems. This skip system was designed to follow the natural angle of repose of the pit wall which on the Mesabi Range is 38°, but can vary from 25° to an average maximum of 45°, making for the shortest hauling distance from pit bottom to surface of any of the four haulage systems. Because of the straight track used, the skips can be operated at higher speeds than either trains, trucks, or belts even at the steep track grade, making for large production capacity.

Like rail or truck haulage, skip systems permit great flexibility in mining. The skipway track can readily be extended to follow the mining operation as the pit deepens.

By using a double drum hoist, loading of skips at various benches or pit levels is easily accomplished to permit mining at any location in the pit as desired. No sizing equipment is required in the pit because the skips will haul anything the shovels can load or the trucks can carry to the skips.

These advantages are the major advantages of train truck haulage and are also present in skip systems. Like train and truck haul systems, skip systems can handle ore and/or waste simultaneously interchangeably as desired. Actually, alternate or succeeding skip loads can be either waste or ore and there is no delay in loading, hauling or dumping the skips.

Like a conveyor belt system, skip systems use only a short truck haul on the pit bottom or on the pit benches. Also, no wide and expensive well-maintained haul roads are required. A simple access road is sufficient and this can be narrow and relatively steep, leaving more pit area available for mining.

In addition, a skip system requires a minimum of personnel. Only a hoist man, a truck spotter and a man to unload the skip dump pocket or bin are required, in addition to a relatively few truck drivers in the pit.

Skip systems have extremely low maintenance costs, as there are so few moving parts and wearing parts in the system.

Skip systems require very little investment in standby equipment or spare parts. One spare skip, a spare cable and a few electrical supplies such as contractors are usually all that is required.

Operating Costs Compared

For the purpose of obtaining cost information for this article, a few mining companies were asked to work out operating costs for the various haulage systems applied in a hypothetical open pit. Each company was given the same information as to vertical lift involved, tons per hour to be handled, and so forth. They were asked to base their study on their own operating cost experience.

As a result of the study, the following information was obtained: One large company which included depreciation costs in their figures reported:

Train haulage costs were $0.038 per ton.

Truck haulage costs were $0.13 per ton.

Conveyor costs were not available.

Skip haulage costs were $0.05 per ton.

Another large company provided information as follows, not including depreciation:

Train haul costs $0.087 per ton.
Truck haul costs $0.061 per ton.
Skip haul costs $0.02 per ton.

Again specific conveyor costs were not available; however, generally it can be said that a conveyor system can be operated for about two-thirds of the cost of a truck haul system. But of course specific circumstances can vary any of these figures greatly in either direction.

From this information it can be seen that open pit skip systems, properly applied, provide more major operating advantages than any other single haulage system in use today.

Roof Support with Continuous Mining

By R. D. JOSEPH and EDWARD M. THOMAS

Respectively, Health and Safety Mining Engineer and Mining Engineer, Project Leader, Roof Control, Bureau of Mines, U. S. Department of the Interior

Two engineers discuss the need for planned roof control and roof support with continuous mining and outline some of the methods in use

REPLACEMENT of conventional mining equipment by continuous miners is affecting virtually all phases of bituminous-coal production. In particular, it has promoted economic changes to which it owes its growth and survival. Continuous miners have created new safety problems, intensified some of the minor ones, and eliminated others. As development of continuous mining evolves, it brings into focus the urgent need of planned roof control and roof support, because its use limits the size of the producing area and dependence is often placed on a single opening. In such confinement it concentrates the section's workmen, adding importance to the interdependence of manpower, machinery, and the working area. Highly concentrated mining magnifies tremendously the coal mine's potential as a source of major catastrophes from the hazard of roof falls. The average size of falling rocks that have caused a death or deaths indicates the space covered by the fall and also the potential of the hazard to grouped personnel. During 1956 such fallen rocks were, on an average, 13 ft long, 11 ft wide, and 2 ft thick. Seventy-five percent fell within 25 ft of the working face; in this same area, crews of four to ten men are employed. However, in contrast, it is interesting to note that continuous mining has, to date, proved itself safer by far than any other method of extraction.

At the beginning of 1956 continuous mining and loading machines totaled 5400 mechanical face units. During 1956 approximately 315,000,000 tons of bituminous coal was produced and loaded mechanically, and during the same period 132 fatal roof-fall accidents occurred that were chargeable to mechanical mining and loading. Continuous miners made up 12.5 percent of the units but contributed only 11 percent of the accidents. Among those killed were four continuous-miner operators or helpers, as compared with 46 operators or helpers on loading machines. Hand loading, the greatest offender, produced only 14.5 percent of the underground coal but 33 percent of the fatal roof-fall accidents.

Continuous Machines Confine Mining to Definite Pattern

It is predictable that continuous mining will continue to influence the injury record favorably unless the good record instills us with complac-

ence. Responsible companies have, in the past, gone the limit in making available and installing artificial supports, particularly under experimental or trial conditions. This natural caution is commendable and will, if not replaced by higher production goals, have a restricting and helpful influence. The size of the machine and its mobility (commonly termed its built-in characteristics) are factors contributing to safety. The machine, though mobile, is immobile enough to confine mining to a definite pattern, and by using it we abandon the concept of scattered mining. The underground mine of tomorrow can be expected to resemble more closely the mine on the planning board. This restricted mobility and pattern mining, coupled with the machine's ability to produce in development, give rise to an improved mine layout—a layout in which it is possible to use the natural strength of the roof rock and the strength of the abutting pillars as support. A fixed, planned method of support applied to this fixed mining pattern could obviate errors of judgment of workmen or job supervisors.

One of the Basic Concepts of Mining

The term "roof support" with continuous or other mining implies two closely related, though separate problems:

(1) To control the movement and subsequent breaking of the consolidated strata above the coal seam and of the coal support.

(2) To determine the support requirements of any unconsolidated strata immediately above the coal seam and to devise adequate means of supporting it as mining progresses.

Let us consider for a moment one of the basic concepts of mining: When an underground opening is made at any particular locality, the equilibrium of stresses that nature has established is upset. Ignoring for the moment the theories of the exact mechanics of redistribution of the stresses, it can and should be assumed that every portion of that opening is being subjected to additional load applied in directions that tend to close the opening. This additional load resolves into directional stresses manifested by strain. For reasonably homogeneous materials, such as steel, load-stress-strain relationships have been quantitatively determined to the point that, with a predetermined factor of safety, structures can be designed with confidence that they will stand up under the foreseeable load that will be applied. However, it must be remembered that the structure of a mine opening was not predetermined by man; it is not of homogeneous material; and forces and loads applied at the time of their formation are not fully understood. Thus, a relationship established at any particular locality in a mine may not apply at another locality only a few feet removed. Nevertheless, the direction of such loads can be determined; and, through the laws of probability, enough sample determinations can be made as the opening progresses to forecast, with reasonable accuracy, the amount of artificial support that should be supplied to future projections and to maintain the openings already made. Considering only the roof or the portion subjected to the loads of gravity, as well as the loads suggested above, the moment an opening is made—in fact, somewhat in advance of the making of the actual opening—the immediate roof starts to sag and does not stop sagging until either the roof rock fails or the stresses applied to resist this sag reach equilibrium; in other words, roof sagging ultimately ends in failure, unless the strength of the rock with or without added support offers enough resistance to maintain equilibrium. The amount of reinforcement necessary to bring about a state of equilibrium can be virtually determined from an interpretation of measurements indicating the rate of sag, the amount of sag, and the time of sag.

Measuring Roof Sag

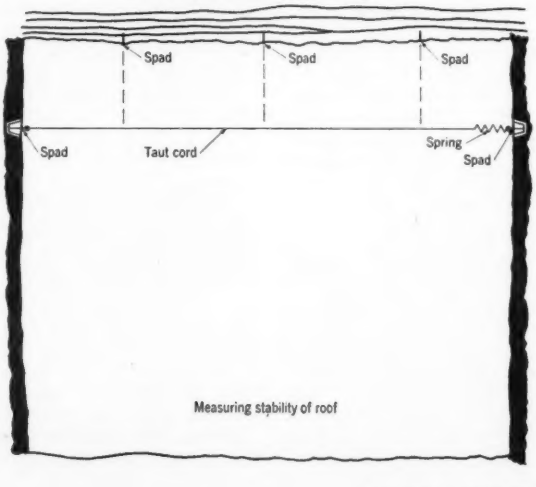
Practical instrumentation for measuring this type of data and methods of interpretation has been devised by J. C. Hartley of the Bureau of Mines (Figure 1). The method involves establishing measuring stations at regular intervals as close as possible to the advancing face. The station consists of surveyors' spads installed in each rib several inches below the roof line, to which a plumb line is fixed. When measuring, tension is maintained at about ten lb by means of a small spring scale.

Three or more spaced measuring points are established in the roof directly over the line. Periodic vertical measurements are taken with a scale reading to 0.01 in. until stability is apparent. Inspection is made at the same time for roof cracks that would indicate excessive beam flexure. Supplemental information can be gathered by use of the stratascope, a periscopic device used to detect fissures in the overhead strata. The device is being made available in permissible-type equipment. It is sectionalized and has a maximum reach of 11 ft, which is usually beyond the archline of narrow openings as made by continuous miners.

Support Requirement Less with Continuous Mining

Having determined an adequate support plan for a given set of conditions, there remains the problem of mechanically installing artificial supports as needed. Admittedly, the requirement with continuous mining is considerably less than with other types of extraction, because there is less disturbance of the coal seam and the surrounding strata. Likewise, the support features of the arch or elliptical opening definitely contribute toward self-support. Roof-bolting appliances mounted on the frames of continuous miners that permit bolting in advance of an operator are, in some instances, a satisfactory solution of the problem. However, an entirely satisfactory system of applying support when and where needed and one that does not impede operations has as yet not been devised.

Figure 1. Necessary roof support can be virtually determined from an interpretation of measurements indicating the rate, amount and time of sag



Compromise is necessary, but do not let us content ourselves with general application of support that is not within 16 ft of the actual face so that the machine operator is always protected.

Results of Bureau of Mines Survey

The Federal Bureau of Mines conducted a survey during the early part of 1956 to determine: (1) The extent to which roof bolts were being used in conjunction with continuous miners and (2) the general application of the continuous mining machine. At that time over 300 machines were in use in 109 mines, in the continental United States and Alaska. Over 50 percent of the machines were in Pennsylvania. All machines except three of low-vein type were operating in coal beds over 36 in. thick. Fifty-five percent were in beds whose thickness ranged from 60 to 96 in. Roof bolts were being used in approximately 50 percent of the mines. The width of places varied from 9 to 25 ft, the average being 17 ft. Over two-thirds of the machines used were of the ripping type.

The application of both boring-type and the ripping-type machines was similar, in that a pocket was advanced a fixed distance into the solid; the machine was then retrieved and support applied to the exposed area. The depth of the pocket varied in accordance with the roof conditions, extremes being 4 and 112 ft. In general, the practice was to drive the pockets 18 to 20 ft deep, measured from the support line. In some instances, jacks, props, or both were used as temporary supports.

Where the width of a place was greater than that of the machine, alternate pockets were advanced and supported. The common practice with the ripping-type machine was to advance the single pocket, while with the boring-type it was ordinary to use the two-pocket method.

The permanent support plans varied sharply. Roof bolting, used to the greatest extent (because it can be applied against the new face and because it provides a maximum of face operating space), was usually patterned on four-ft centers both across and with the place. Crossbars were bolted in places where the rock beam required reinforcement. Where timber was used as permanent support, the usual system was to set a row or rows of props spaced equally from both ribs, using the center of the place as the roadway.

Support Plans

In a two-pocket method of advancing, permanent supports are installed and maintained from the face a distance equal to the length of the machine to permit maneuvering. Jacks and crossbars are used as temporary supports when the distance driven exceeds the distance from the face to the position of the machine operator. This method illustrates the inadequacy of posts when compared with roof bolts as components of a support system. Roof bolts in this instance can be applied across the completed span and close to the new face after each advancement. A maximum operating space is provided and the resetting of supports is eliminated.

Figure 2 shows the use of a two-place square-block system. Roof bolts installed on a four-ft pattern are used as supports. The cycle of operation begins with bolts installed four-ft from the face. The face is advanced 17 ft, or the distance required to insure that the operator is under bolted roof. Bolting is completed at one face while the machine advances in another. In turning intersections an extra three bolts along the rib line are installed, the crosscut is advanced 17 ft, then bolted, while the entry face is being advanced.

In one method of advancing and turning intersections, four-in. H-beams are kept within 12 ft of the face and set at intervals of 3½ to 4 ft. The beam is never more than 17 ft from the face, and the operator is prohibited from going beyond the last beam. Intersections are turned at 45°; beams are set across the angle of the crosscut until it has advanced its distance, then the beams on the turn are reset for the straight place. Jacks are used as temporary support while the beams are being reset. In some methods these beams are supported over the machines by means of hydraulic jacks permanently fastened to the continuous miner; as the miner advances, legs of steel or wood are placed. In some instances the crossbars are considered permanent; in others, the roof is later bolted, and the crossbars are removed.

In conjunction with ripper-type continuous miners at four large mines, roof holes are drilled and bolts installed without interrupting the continuity of operation. To do this, drills are installed upon the bedplate ahead of the operator's position. The three insertions of the cutterhead into the coal face before movement of the entire machine forward allows enough time to drill the bolt holes.

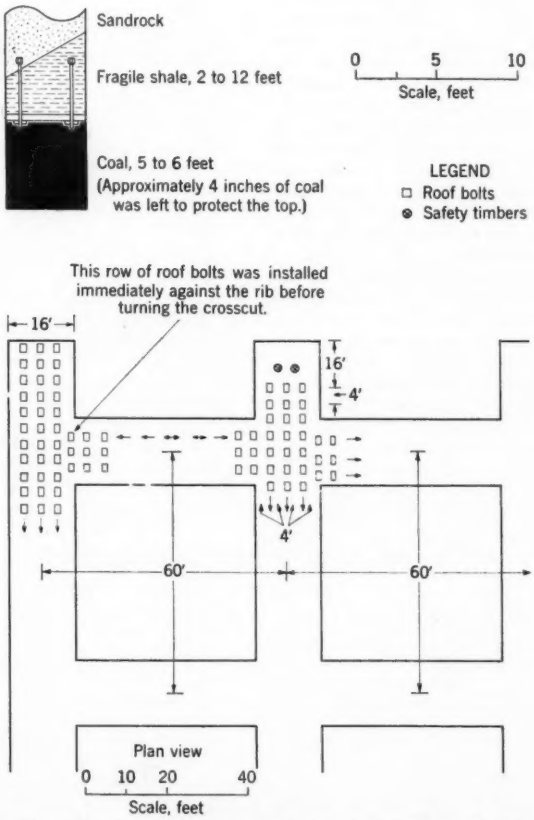


Figure 2. A two-place square-block system using roof bolts installed on a four-ft pattern as supports

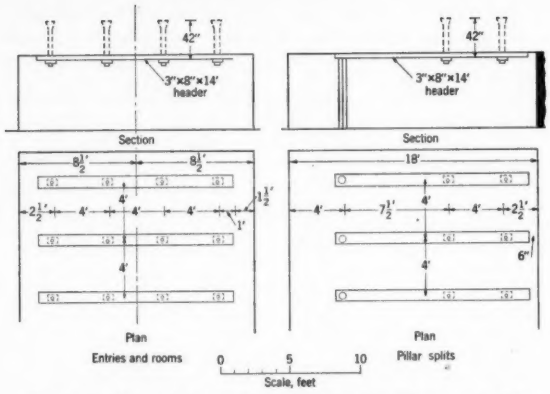


Figure 3. Support is applied as the mining advances in this method of support used in room-and-pillar work

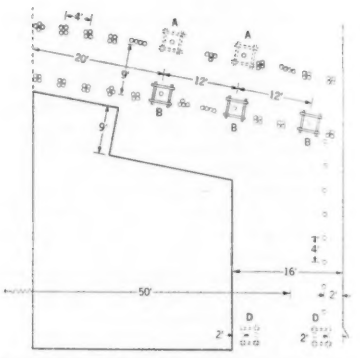


Figure 4. This method of open-end pillar recovery uses short roof spans in relatively strong roof. Dependence is placed upon the heavy inside coal abutment for extra support

In another system bolted beams used at intersections become part of the permanent support system.

Figure 3 shows a method of support used in room-and-pillars work. Support in either instance is applied as the mining advances. In the open-end slicing of pillars, a wood beam is used to strengthen the rock beam formed by bolting. Bolts are placed close to the coal pillar. The roof span in this case is assisted somewhat by the use of post under the end of the wood beam.

Figure 4 illustrates a method of open-end pillar recovery. The system uses short roof spans in relatively strong roof. Dependence is placed upon the heavy inside coal abutment for extra support. Spans are kept short by the use of cribs or post breakers set before the pillar is sliced.

Wide roof spans are used as well as longer producing runs in the method of pillar recovery shown in Figure 5. Timber support is applied as the mining advances. Coal fenders left standing to help support the long roof spans are not recovered. Again this is an illustration of acquiring a major part of the support from the heavy abutment. This method is particularly valuable in areas under heavy cover where "bumps" are a problem.

Figures 6 and 7 illustrate mining layouts that have been planned specifically for continuous mining. They illustrate a method of development and mining in which only approximately 20 percent of the coal is removed in the advance mining and involve use of a pattern through which development mining is spread equally over the area. This method seems to have distinct advantages in that: In the original mining there is little but even disturbance to the overburden. The area is large enough so that, when fully extracted, good caving can be accomplished. Supporting pillars or blocks are evenly sized, so that the load is distributed evenly; this, to some extent, curbs breaking of the roof around prominent blocks and should assist in maintaining better roof structure at intersections. Pillaring will be accomplished from a strong abutment, giving maximum support to the cantalevered beam, making more feasible the use of solid supports on the end of the beam.

Methods such as these, when coordinated with studies of roof behavior, should be the means through which support can be minimized though made adequate for safety.

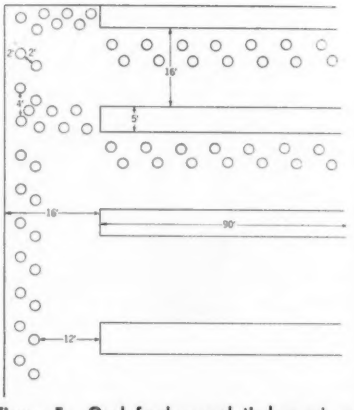
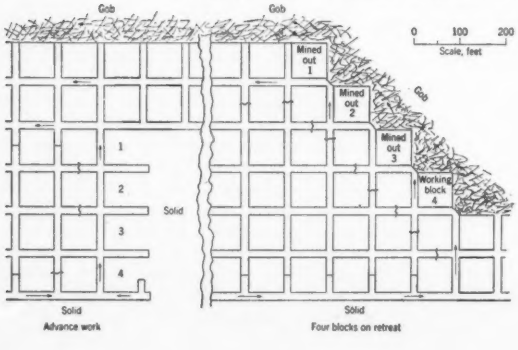
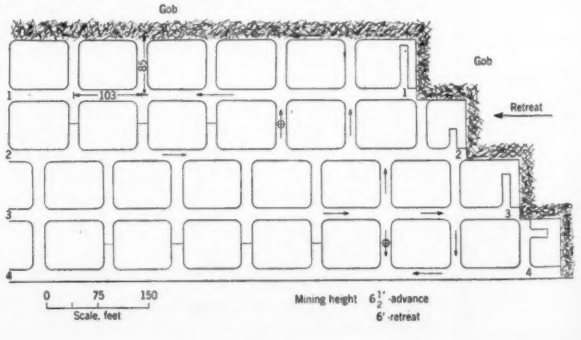


Figure 5. Coal fenders and timber set on the advance have proven valuable in controlling roof in pillar recovery work where "bumps" are a problem

Figures 6 and 7. Mining layouts that have been planned specifically for continuous mining





PERLITE

and

Other Lightweight Aggregates

The perlite industry comprises one of the newest and fastest growing components of the nonmetallic minerals field

By P. W. LEPPLA
Technical Director
Dicalite and Perlite Divisions
Great Lakes Carbon Corp.

PERLITE is a volcanic glass, acid in composition, that contains about three to eight percent of water. Exactly in what manner the water occurs is still a matter of dispute. The important point is that the water is tightly held so that it is not readily expelled by low temperature heat. Hence perlite particles, subjected to very rapid heating by direct contact with a flame above about 1400°F, expand to many times their original size. The product is commonly known as popped or expanded perlite.

Because of the excellent properties of expanded perlite as an aggregate, the perlite industry has grown from a shaky start in the early 1940's to an important new industry, with an annual volume of over $12,000,000. The rate of growth is about 20 percent per year. The industry comprises one of the newest and fastest growing components of the non-metallic minerals field. In 1949 the Perlite Institute was organized. At the present time this association includes 53 member firms. It has taken the lead in establishing product standards and in promoting new uses for perlite.

Perlite is competitive to vermiculite in the very lightweight aggregate field. These materials are in a class by themselves as aggregates having loose bulk densities of about 5 to 15 lb per cu ft.

Sources of Ore

The early development of perlite occurred in Arizona, near Phoenix and Superior. Two small quarries and crushing plants still operate in this area.

Three perlite rock quaries are in operation in California. These are, International Minerals and Chemicals, Monola; Perlite Aggregates, Inc., St. Helena; and California Perlite Corp., Klondike.

Among the major sources of crushed and sized perlite ore are the Socorro, N. M., and Florence, Colo., plants of Great Lakes Carbon Corp.; the Antonito, Colo., plant of the F. E. Schundler Co.; and the Pioche, Nev., plant of the Combined Metals Co. These concerns supply a number of grades of prepared perlite ore to the trade. The U. S. Gypsum Co. operates plants at Grants, N. M., and Lovelock, Nev., primarily for their own use.

Recent annual statistics for crude perlite and vermiculite are given in the accompanying table. These include material produced, sold, or used by U. S. producers.

U. S. producers export perlite to serve the Canadian industry, which includes eight expanding operations.

Mining and Milling

Most of the perlite deposits presently exploited consist of more or less massive volcanic flows. The rock is quarried from open pits by rippers and scrapers or power shovels. Blasting is occasionally employed.

Because of the abrasive nature of the perlite rock and the necessity of preparing the sized ore to very narrow sieve analyses, most crushing plants include two or more stages of crushing, often with as many as four stages of scalping screens.

Jaw crushers and impactors are used for primary crushing; hammer mills or cone crushers are preferred for second stage crushing. Final crushing may be performed by cone or roll crushers. Final sizing is accomplished by vibratory wire screens followed by air classifiers for recovery of fines.

Milling rates range up to about 40 tph.

Sized products are usually shipped in bulk in box or hopper cars. The most common grade for plaster aggregate is minus 16 mesh. Concrete aggregate is slightly coarser.

In general, for aggregate the percentage of material passing a 100

After receiving a Ph.D. degree in chemistry from the University of Illinois in 1937, Paul W. Leppla was employed for five years by Continental Can Co. on packaging problems.

For the following six years he was with Cardox Corp. in charge of the Chemical Division in which chlorates, perchlorates and liquid carbon dioxide were manufactured.

Dr. Leppla joined Great Lakes Carbon Corp. in 1947. He was made associate director of research on carbon, graphite, diatomite and perlite products in 1949. In 1951 he became technical director of the Dicalite and Perlite Divisions.

mesh sieve is held below ten percent. Both fine and coarser grades are also furnished for other uses.

Ore Furnaced to Produce Lightweight Aggregate

The sized ore is shipped to over 80 local processing plants in the U. S. and Canada, where the ore is furnaced to produce the lightweight aggregate. Most of the expanding plants operate at about one tph, since the most commonly used furnaces are designed for this rate. Several plants operate two furnaces with an hourly rate of about three tph.

In the early days of the industry, a great variety of types of furnaces were developed. Most of these have become obsolete. Several well established furnace designs have evolved; one of the most common is a rotary horizontal with a concentric preheating shell surrounding the direct fired expanding tube. Three different stationary vertical furnaces, fired at the bottom, have been accepted by the industry. These are used with or without a separate preheating tube. There are about 120 furnaces in operation in the U. S. and Canada.

Preheating is generally resorted to as a means of increasing production rates, of minimizing the formation of fines, and to control expansion of the various sieve fractions to uniform densities.

Product Characteristics

Expanded perlite is a white aggregate with the individual particles approximately spherical in shape. Under the microscope, the glassy nature of the material may be seen. Each aggregate particle consists of a large number of individual, more or less spherical glass bubbles, joined together by common cell walls. Some of the bubbles are often blown open by the violence of the expanding process which ordinarily occurs in less than 0.1 second.

The superior performance of perlite as an aggregate resides principally in the fact that most of the cells are sealed. Thus, they do not absorb water when mixed in the normal manner with gypsum plaster or concrete. Low water/binder ratios and freedom from water absorbtion are responsible for unusually high strength/weight ratios and reduced drying times.

Chief Use Is in Plaster

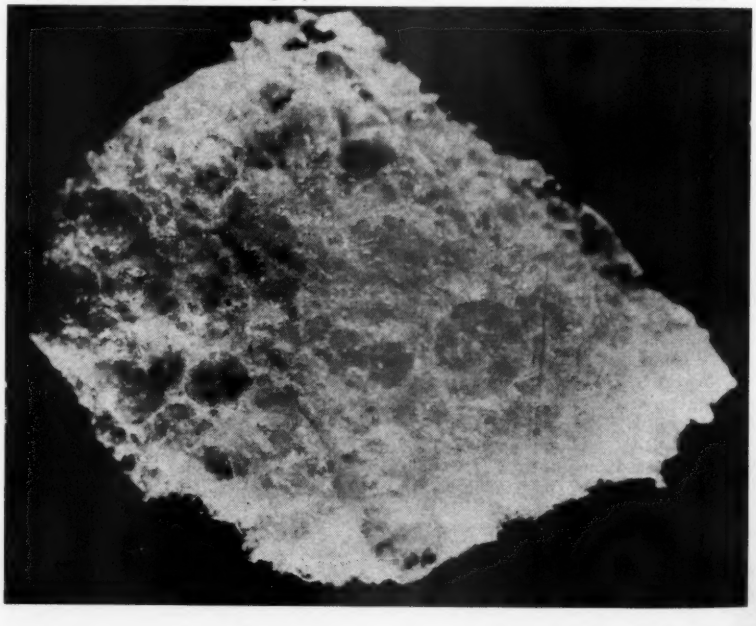
The first large tonnage application of expanded perlite was as a replacement for sand in gypsum plaster. Here the light weight of the wet plaster was enthusiastically received by the plasterer. The light weight and resistance to cracks of the perlite plaster contributed to its acceptance by the building products industry. Threats to this market by dry wall construction have been more than

(*Continued on page 92*)

Most of the perlite deposits presently exploited consist of more or less massive volcanic flows. The rock is quarried by rippers and scrapers or power shovels

	Perlite (Tons)		Vermiculite (Tons)
	Perlite Institute	U. S. Bureau of Mines	U. S. Bureau of Mines
1950	—	110,694	208,096
1951	153,502	154,174	209,008
1952	164,845	190,442	208,906
1953	198,750	213,532	197,000
1954	219,703	261,024	—
1955	280,000 est.	—	—

Perlite aggregate particle—it will expand to many times its original size when subjected to very rapid heating by direct contact with a flame hotter than 1400°F



Strip Mine Maintenance

By EMIL SANDEEN
Superintendent,
Pittsburg & Midway Coal Mining Co.

THIS account of strip mine maintenance is based on observance, practices, and experience encountered through 30 years in and around open pit mining in southeast Kansas.

Maintenance actually is not new. The need for good maintenance has been with us since the beginning of man's productive ideas. Over the centuries many have believed in maintenance, while others have treated it with great indifference. Being faced with our rapidly rising costs, many nonbelievers have eliminated themselves as business competitors due to this indifference.

One of the operations of the Pittsburg & Midway Coal Mining Co.—namely, P & M Mine No. 19—is located near Hallowell, Kan., approximately 35 miles southwest of Pittsburg, in an area known as the Neosha River Valley. In this area there are two predominating veins of coal, one the Fleming vein and the other Mineral vein. Each of these average 17 in. in thickness. The overburden ranges from 20 ft to whatever depth one's courage will stand. The company at present does not exceed 45 ft, endeavoring to keep the digging ratio below 30 to 1.

The mine's stripping equipment consists of a 950-B Bucyrus Erie 33-yd shovel which began operation in 1938 and a 770-B Bucyrus Erie walking dragline, 20-yd capacity, which began operating in January of this year. The latter replaced a ten-yd Monighan diesel electric walking dragline.

Most everyone is aware of the fact that good maintenance and the facilities to perform it are very essential to any type of production. But actually a good preventive maintenance program is the keynote to automatically lessening the number of breakdowns that otherwise would require all of your maintenance facilities.

Overburden Equipment and Maintenance

Overburden consists of gray shale and black slate, limestone and cap rock, all very hard. Our first step toward preventive maintenance begins with good preparation of the stripping area. Due to the formation above the rock bed, it is most practical that horizontal bore holes be used. This is done with three McCarthy bank drills—drilling on 27-ft centers, 88-ft deep. The company prepares its own explosives using prilled nitrate purchased from Spencer Chemical Co., which it packages into tubes 4½ by 48 in. This blasting agent has proven very effective in improving yardage per hour. Cable life has increased from an average of 3,000,000 yd per cable to 4,500,000 yd. How much this act of preventive maintenance has aided the rest of the stripper is hard to say, but the extended cable life undoubtedly speaks well for the machine in general.

To carry the program further, each of the strippers have an oiler on each shift with a designated part of the machine to inspect every day thoroughly. Thus in the course of six days each stripper is completely inspected and all findings reported. Of course anything that could result in serious damage is taken care of immediately. Minor findings are kept on record and are taken care of at such times when the machines are idle for other causes.

Three maintenance men are used in this 500 tph cleaning plant of the P & M Mine No. 19

With the stripping combination of a ten-yd dragline and 33-yd shovel moving some 14,000,000 cu yd of overburden annually, cost per cu yd at this operation has been four cents

Strippers are operated 24 hours a day, seven days a week when business warrants. During slack sales periods, the mine is afforded an excellent opportunity to do maintenance during the daylight hours and strip the remainder of the 24-hour period. This blending of maintenance and production through the same period has proven very effective, probably more so to an operator in a low recovery per acre area.

It seems almost impossible to present concrete figures to evaluate each preventive procedure. However, it is possible to present some over-all figures.

With the stripping combination of the 1933 Model 10-W dragline and the 1938 950-B shovel moving some 14,000,000 cu yd of overburden annually, even facing the present high prices, our cost per cu yd has been four cents. Maintenance delays have been seven percent of the possible digging time. With the aid of the new 770-B, management, of course, expects to lower this percentage figure. In fact to this date cost per yd for the 770-B has been two cents.

At mine No. 19 and its 17 in. of coal, the company uses an 85-B Bucyrus Erie equipped with a horizontal boom and thrust type bucket, commonly known as a skimmer scoop, and a 38-B conventional shovel to load the coal. This combination picks up approximately 4200 tons per 6 hr and 45 min loading time. Conducting a perpetual preventive maintenance program on machines of this type is rather hard due to the number of inaccessible places while operating. So it becomes necessary on each idle loading day to give each machine a thorough check. Knowing the approximate cable life, hoist cables are changed before breakage time. This eliminates danger of a serious breakdown as well as production stoppage.

Spare Truck Proves Profitable

This operation has found that spare units are a very good investment. For example No. 19 has eight 40-ton coal haul units. Normally seven are all that are needed. This provides a spare which has proved very profitable simply because it is quicker to change drivers than to change a tire or make some mechanical adjustment. The spare unit also gives ample time for major maintenance to any of the rest of the fleet without the burden of premium pay hours.

The truck maintenance crew consists of three men. One is a master mechanic who's chief interest lies with the engines and their mechanical components. Another man, also a mechanic who's chief interest lies filter changes and checking of tires. This tire situation has proven very effective. Since 1951 the mine has had but two flat tires to interrupt its loading day. The third man in this group is a mechanic who's first job is to keep all units lubricated. Being a mechanic he naturally keeps a very close watch for any indication of a possible mechanical failure. This has helped greatly to improve on spring life, shackle failure and brake problems. To further aid the preventive program for the haul units, the mine maintains the best of all weather roads possible.

Along with the haulage units, this crew of three also services the road patrol, refuse trucks, high lift, wench truck, pumper service wagon, line truck, and four ten-ton auxiliary units.

To carry this program through the cleaning plant, three maintenance men

Knowing the approximate cable life, hoist cables on this shovel are changed before breakage time. Tractor on the left is equipped with a pinning attachment for breaking shale

are used. Their shift begins three hours before the end of the loading day. This gives them the opportunity to observe various working parts and make necessary readiness for the evening. Any large undertaking such as rebuilding of conveyors is lined up for idle days when a full crew can be used.

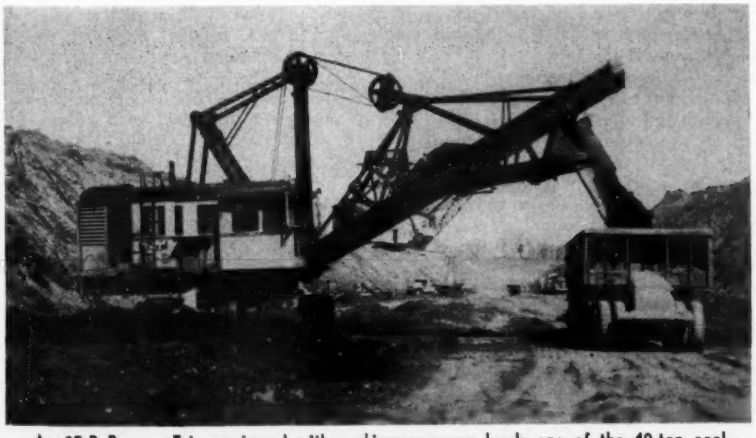
Shop Repairs and Overhauls

As mentioned earlier, the facilities to do good and quick maintenance is a must. To complete the maintenance setup the mine has an electrical department capable of handling any electrical emergency. This department keeps a complete card file on all motors as to the running time and all work spent on each motor. Long years of experience has taught the chief electrician the life expectancy of heavy-duty motors. With this knowledge and records he can regulate the necessary change time for armatures, etc.

Sometimes the author is not in complete agreement with the time he has selected, and very dryly the electrician reminds him that his department is a first aid station and not a hospital. Having a 0.4 percent electrical delay time since 1951 to prove his point, doesn't leave any room for doubt. Actually preventive maintenance is first aid to all your equipment.

The machine and welding shop is capable of repairing all spare parts. Parts that are not practical to build or repair are kept in storeroom stock. Three welders are used in the welding department, all of which are subject to field calls. To speed this there is a mobile unit with one electric and one gas-driven welder mounted on it. It also has a complete supply of welding rod, oxygen, acetylene, torch, jacks, plate and numerous working tools. Having this unit ready to go eliminates all of the loading and unloading time usually encountered to do a repair job.

Good equipment to handle material while doing maintenance work is very important. For example, in a complete overhaul to the gear train in the crawlers of the 950-B, it used to take 14 hours to complete the job. After adding a ten-ton mobile crane capable of hoisting and lowering the boom as well as swing, the same job is now done in seven hours. This is very true in any part of an operation—make it handy and it will pay.



An 85-B Bucyrus-Erie equipped with a skimmer scoop loads one of the 40-ton coal haul units

Where Does Safety and Maintenance Meet?

To this point, all that has been covered has to do with equipment in the line of production. Let us examine a little of the company's safety program that has to do with the welfare of the workers. Perhaps a first thought would be where does safety and maintenance meet. To the author it seems that safety is really preventive maintenance for the physical effects of the workers—men who have been trained to do a specific job.

The personnel director supervises the safety program. At each of our mines a safety meeting is held one 45-minute period each month. All workers are present—strippers are stopped so the crew on duty can attend. To stimulate interest safety films are shown or some speaker is present such as a Federal mine inspector, insurance representative or a first aid drill team. If any accidents have occurred at any of the operations, these are discussed openly as to what could have been done to have avoided the accident. To further create interest as well as improve the safety program, sponsors are appointed for respective areas such as the cleaning plant, shop, stripping and loading. It has been found that men are sometimes reluctant to make suggestions to their supervisor, but will openly discuss their thinking to a fellow worker. The sponsor then reports the safety suggestion. All safety suggestions are given due consideration and taken care of. This tends to bolster the morale of the workers. Quite often a safety suggestion has aided production.

Cleanliness is another important factor that not only aids the appearance of operation but it establishes a pride among the workers and makes a safe place to work.

Along with the safety program, management has set a tonnage mark for a day's run. When this is reached, the workers are treated to a dinner of their liking. The pleasure management has received from the safety program are records such as these: One mine in Kentucky, 1300 days no lost time, and the Colorado mine, two years no lost time. Mine No. 19 has not been able to establish this kind of record, but it does have the honor of being the first and only mine in the state of Kansas to receive a 100 percent stamp of approval from the Federal Bureau of Mines.

Operation and Maintenance of THERMAL DRYERS

Jack M. Bishop
Subcommittee Chairman

Committee on Coal Preparation of American Mining Congress Coal Division reports on its survey of heat dryer installations

INCREASED activity in fine coal preparation has sparked a growing interest in thermal drying among coal preparation men the world over. The Committee on Coal Preparation has gathered information on 21 heat-drying installations using a total of 41 drying units. Twenty-one seams of coal are represented, as are 16 companies from all over the United States.

While no sweeping conclusions can be made after analyzing the report, all who were connected with the compiling of the data are sure of one thing —thermal drying is here to stay. Perhaps just as significant as the information on existing thermal drying installations that was collected was the interest shown by companies not now using heat dryers. To those who are planning to make thermal drying installations in the future, and to all preparation men who are interested in seeing how "the other fellow does it," this report will prove of value. It shows what is being done with different types of drying units under a wide variety of conditions.

Equipment reported upon falls into six general types according to the following classifications:

Screen Type—A unit which consists essentially of a decline reciprocating screen over which the coal travels and through which hot gases are passed.

Cascade Type—In this type dryer, coal is allowed to fall freely through the drying chamber where hot gases are introduced to extract the moisture.

Suspension Type—Wet coal is continuously introduced into a column of hot gases. The dry coal and moisture-laden gases are drawn up into a chamber from which the gases are discharged and the coal is collected.

Rotary Cascade Type—Wet coal is plowed off a circular shelf at the top of dryer with the hot gases being drawn up through the center of the unit and out through the falling curtain of coal.

Solid Coal Curtain Type—This is the same type machine as the Rotary Cascade except for one point. The curtain of coal, after it is dried, accumulates on a circular shelf at the bottom of the dryer from where it is plowed out of the unit.

Turbulent Entrainment Type—Basically a suspension type dryer, the turbulent entrainment dryer differs in that it operates as a forced draft instead of an induced draft unit.

Data presented in Table I are grouped according to the above classifications. A discussion of that data follows:

Feed Size—With the exception of mines C, D, I, R and T the lower size limit of the coal was zero. The upper limit is 1¼ in. and that top size is heat-dried at four installations.

Preliminary Conditioning — Except for two units, all of the dryers reported upon are used to reduce moisture in a clean coal product. The exceptions are Mines G and H where three cascade type units pre-dry raw ⅜ in. by 0 coal ahead of air-cleaning plant. There is no preliminary conditioning here. In the other plants, centrifugal drying is the most common method of conditioning with shaker or vibrating screens a close second. Mine B uses a vacuum filter, and Mine F uses a classifier drag and drainage bins as conditioning devices.

Feed Moisture — Total moisture of feed varies from 6 to 24 percent with reported surface moisture ranging from 3.8 to 14.5 percent.

Product Moisture — Total moisture in the product varies from 3 to 13 percent with surface moisture ranging from 1 to 4.0 percent, except at Mine C which report 0 to 0.5 percent surface moisture.

Water Evaporated per Unit—The whole point of thermal drying is water evaporation of course. Figures included in this report for the amount of water removed should not be considered as anything but a rough indication of what each dryer unit can or should do. Such variables as retention time, temperatures and the tonnage fed to each unit as compared to its rated capacity will have their definite influence on the water evaporation figure.

Operating Personnel — As a rule, one man was reported as needed to operate a drying plant. Four companies reported two men per shift, while three reported ½ man per shift. It should be remembered that although a man is given the responsibility of operating a section of a preparation plant he often works on other assignments. This is certainly the case at thermal drying installations and it would perhaps be more correct to assume that labor needed to operate a thermal drying plant is less than one man per shift.

Type of Fuel—There is no consistency in the type of fuel used in the various plants with pulverized coal, raw coal, clean coal and 48-mesh by 0 dust being used at different operations.

Fuel Consumption—Fuel consumption ranged from 360 to 2000 lb per hour at the mines reported on. Such variables as the Btu content of the fuel, the amount of moisture removed, and the final product moisture would affect this figure.

Dryer Fuel—As received, the Btu content from mines reporting ranged from 10,912 to 14,550 with a dry Btu range of 12,300 to 15,000.

Temperatures — Inlet temperatures of drying gases in °F vary from 550 to 1100. Outlet temperatures vary from 90 to 250 °F, except at Mine S where an outlet temperature of 550° F is reported. Most mines, however, reported in a 65° range from 120 to 185° F. Coal temperatures after drying are from a low of 80 to a high of 300° F.

Maintenance Program — Maintenance programs vary from plant to plant but as a rule hinge about a regular inspection of automatic controls, dryer, and furnace and stoker.

TABLE I—Data on maintenance and operation of thermal drying equipment.

(Continued next page)

	SCREEN TYPE					CASCADE TYPE (Continued on next page)	
	Mine A	Mine B	Mine C	Mine D	Mine E	Mine F	Mine G
Number of Units	4	1	3	3	1	1	1
Seam of Coal Washed	#2 Gas Dorthy #5 Block Cedar Grove	Upper Freeport	Ill. #7	Ill. #6	Roslyn 1 & 5	Ill. #6	#2 Gas
Feed Size	⅜ x 0	½ x 0	1¼ x ¾ ¾ x ⅛	1¼ x 10M	¼ x 0	½ x 0	⅜ x 0
Percent Minus 28-M	19.2	20.3	0.7	0.9	40	25	25
Rate of Feed (Dry Basis) (tph)	50.3	35	88	80	50	20	120
Preliminary Conditioning	Cent. Dry	Hor. Filter	Vib. Screen	Vib. Screen	Cent. Dry	Classifier Drag Bin	—
Feed Moisture (%):							
Surface	—	14.5	3.8	6.0	8.0	12	—
Total	8-8.5	15.3	15.8	11.2	11.0	24	6-8
Product Moisture (%):							
Surface	—	3.4	0-0.5	1.5	1.0	1	—
Total	4-5.0	4.2	12.0	6.7	4.0	13	3
Hours Operated/Day	14.5	24	7	7	14.5	7	21.75
Water Evaporated/Unit/hr (lb.)	6,500	8,740	7,000	7,200	9,100	—	—
Operators/Plant Shift	2	1	2	1	1	1	½
Type of Fuel	Pulv. Fuel	½ x 0 Row Coal	¼ x 0 Coal	3/16 x 10M Coal	Coal	Coal	48M x 0 Coal Dust
Type of Stoker	—	Spreader	Spreader	Spreader	Spreader	Iron Fireman	Iron Fireman
Fuel Consumption (lb/unit/hr)	1,240	1,370	1,000	950	700	1,000	—
Btu Content of Fuel:							
As Received	14,036	12,850	10,912	12,557	11,800	—	—
Dry Basis	14,256	13,300	12,960	13,503	12,300	—	12,400
Inlet Gas Temperature (°F.)	1,000	950	850	600	550-600	—	650
Outlet Gas Temperature (°F.)	120	250	90 (Exh.)	105	125-150	—	140
Temperature of Dry Coal (°F.)	130	135	95	110	100-110	—	80
Through Volume of Air (CFM)	60,000	40,000	35,000	39,000	45,000	—	30,000
Maintenance Schedule:							
Automatic Controls	Daily	Weekly	Daily	Quarterly	None	—	Quarterly
Dryer	Daily	Weekly	Daily	Daily	None	—	Weekly
Furnace and Stoker	Monthly	Weekly	Daily	Daily	None	—	Monthly
Primary Dust Collection:							
Single Cyclones	—	—	—	—	—	—	Yes
Multiple Cyclones	Yes	Yes	—	—	Yes	Yes	—
Other	—	—	Yes	Yes	—	—	—
Secondary Dust Collection:							
Dry	—	—	—	—	—	—	—
Wet	Yes	—	—	—	—	—	Yes
Disposition of Dust	To Fuel	To Product	—	—	To Product	To Product	To Fuel
Disposition of Scrubber Effluent	Returned to Circuit	—	Returned to Circuit	Returned to Circuit	—	—	To Waste

Mine E reports that bearings on the dryer are adjusted every six months with little other maintenance needed. At Mines K, L and M the dryer column stacks are replaced every two years. At Mine T it is reported that 10 percent of the refractories are replaced each year. The installation at Mine U is new and requirements for routine maintenance have not yet been established.

Primary Dust Collection—At all but four operations some form of collection with cyclones is used for primary dust collection. At Mines C and D gases from the dryer are exhausted to a 16-ft diam concrete stack where water sprays at the bottom of the stack trap the fires which are sluiced to a sump and recovered. The operator of these two plants reports no sign of dust from the dryer around the plants after eight years of operation.

At plant I exhaust gases are given primary treatment in a continuous bath type dust control unit.

At Mine T dryer gases are exhausted to a company built baffled dust chamber with a collecting hopper.

Secondary Dust Collection— Six companies report a secondary dust collection system. With local air pollution legislation on the increase, it would appear that many more coal companies will have to install secondary collection systems than have in the past.

Sixty water sprays, installed in the expansion chamber, at Mine A settle out the dust before the air is exhausted to the atmosphere. Scrubber effluent is returned to the preparation plant recirculated water tank after being treated with lime to increase pH value.

At Mines G and H water sprayed against a baffle plate in the air stream is used to knock down any dust left

TABLE I—(Continued)

Data on maintenance and operation of thermal drying equipment.

(Continued next page)

	CASCADE TYPE—(Cont.)	SUSPENSION TYPE					
	Mine H	Mine I	Mine J	Mine K	Mine L	Mine M	Mine N
Number of Units	2	3	2	1	1	1	3
Seam of Coal Washed	#2 Gas	High Splint B & C	Hernshaw	Lower Cedar Grove	Lower Cedar Grove	Lower Cedar Grove	Clintwood
Feed Size	⅜ x 0	¼ x 200M	⅛ x 0	¼ x 0	¼ x 0	¼ x 0	¼ x 0
Percent Minus 28-M	25	24	20	30	30	30	20
Rate of Feed (Dry Basis) (tph)	40	92	50	70	70	70	76.6
Preliminary Conditioning	—	Cent. Dry	Vib. Screen & Cent.	Cent. Dry	Cent. Dry	Cent. Dry	Cent. Dry
Feed Moisture (%):							
Surface	—	—	—	11	14.5	14.5	10
Total	6-8	7.9	12	12.25	15.75	15.75	11
Product Moisture (%):							
Surface	—	—	—	3	3.5	3.5	2.5
Total	3	2.9	3	4.25	4.75	4.75	3.5
Hours Operated/Day	21.75	24	18	14.5	14.5	14.5	24
Water Evaporated/Unit/hr (lb.)	—	9,900	12,500	13,000	17,000	17,000	12,400
Operators/Plant Shift	½	1	1	1	1	1	2
Type of Fuel	48M x 0 Coal Dust	Pulv. Coal	⅛ x 0 Clean Coal	¼ x 0 Clean Coal	¼ x 0 Clean Coal	¼ x 0 Clean Coal	¼ x 0 Raw Coal
Type of Stoker	Iron Fireman	—	Comb. Engr.	Spreader	Spreader	Spreader	Spreader
Fuel Consumption (lb/unit/hr)	—	1,900	2,000	1,500	1,500	1,500	1,610
Btu Content of Fuel:							
As Received	—	14,000	—	14,550	14,400	14,400	12,780
Dry Basis	12,400	14,000	14,000	15,000	15,000	15,000	13,400
Inlet Gas Temperature (°F.)	650	700	600	900	1,050	900	700
Outlet Gas Temperature (°F.)	140	180	150	150	185	175	160
Temperature of Dry Coal (°F.)	80	120	100	122	140	140	105
Through Volume of Air (CFM)	30,000	53,000	34,000	43,500	43,500	43,500	35,000
Maintenance Schedule:							
Automatic Controls	Quarterly	Weekly	Quarterly	Quarterly	Quarterly	Quarterly	—
Dryer	Weekly	Weekly	Weekly	—	—	—	Daily
Furnace and Stoker	Monthly	Weekly	Monthly	Daily	Daily	Daily	Daily
Primary Dust Collection:							
Single Cyclones	Yes	—	Yes	Yes	Yes	Yes	Yes
Multiple Cyclones	—	—	—	—	—	—	—
Other	—	Yes	—	Yes	—	—	—
Secondary Dust Collection:							
Dry	—	—	—	—	—	—	—
Wet	Yes	Yes	—	—	Yes	—	—
Disposition of Dust	To Fuel	—	—	To Atmos.	—	To Atmos.	To Atmos.
Disposition of Scrubber Effluent	To Waste	To Waste	—	—	To Waste	—	—

after the air passes through the primary dust collection unit. Scrubber effluent is wasted.

At Mine I secondary dust collection is with a second continuous bath type dust control unit. Here, too, effluent is wasted.

A single stack scrubber, six ft in diameter and 30-ft high, is used after the dryer exhaust fan to knock down dust at Mine L. From 75 to 100 gpm are used in the spray system. The effluent is wasted.

Disposition of Dust—Dust from cyclone collectors is used as fuel at two plants using six dryer units. At four plants it is sent to the clean coal product.

Delays

To the question "What are major items of delay time in the system and what causes them?" the following answers were given.

Mine A reported "pulverized feeders plugging due to damp coal" as the major cause for delay.

Mine B reported "about 20 minutes delay per 24 hours because of fine coal building up on the screen surface which requires cleaning before the coal cokes."

Mine C listed "breakdown of auxiliary equipment—conveyor, chain, etc." as primary source of delays.

Primary cause for delay at Mine D is "failure of auxiliary equipment."

Bearings on the dryer are adjusted every six months at Mine E, but no major delays are reported.

At Mines K, L and M, "the replacing of stoker parts" is the major item of delay, with "not more than five hours" required at the time of change.

Mine N listed "drying column and paddle mixer repairs brought on by heat and wear" as causing greatest delay.

TABLE I—(Continued)

Data on maintenance and operation of thermal drying equipment.

	ROTARY CASCADE TYPE			SOLID COAL CURTAIN TYPE			TURBULENT ENTRAINMENT TYPE
	Mine O	Mine P	Mine Q	Mine R	Mine S	Mine T	Mine U
Number of Units	1	1	1	4	2	4	1
Seam of Coal Washed	Pittsburgh	Pocahontas #3	Pittsburgh	Pittsburgh	Cedar Grove & Stockton, Upper & Lower	Ind. 6 & 7	Wattis #2 Lower Split Hiawatha
Feed Size	5/16 x 0	5/16 x 0	¾ x 0	1¼ x 3/16	¾ x 0	¾ x 10M 1¼ x 10M	1 x 0
Percent Minus 28-M	16.2	14.8	15	1.5	2	—	18
Rate of Feed (Dry Basis) (tph)	125	105	100	62.5	40	50–60	100
Preliminary Conditioning	—	Cent. Dry.	—	Shaker	Vib. Screens	Vib. Screens	Vib. Screens
Feed Moisture (%):							
Surface	6.75	10.5	6.75	7.0	8.0	8–10	7.8
Total	8.0	11.5	8.0	8.0	9.5	—	8.8
Product Moisture (%):							
Surface	2.0	2.5	2.0	2.5	4.0	2–3	3.4
Total	3.25	3.5	3.25	3.5	5 5	—	4.4
Hours Operated/Day	21	14	21	20	14	6.75	—
Water Evaporated/Unit/hr (lb.)	12,460	18,780	9,960	6,200	1,800	7,030	9,000
Operators/Plant Shift	1	1	1	½	1	2	1
Type of Fuel	5/16 x 0	5/16 x 0	¾ x 0	Middling	¾ x 0	¾ x 10M	Dust From
Type of Stoker	Clean Coal	Clean Coal		Coal			Cyclones
Fuel Consumption (lb/unit/hr)	—	—	—	Riley C.A.D.	—	Fire Rite	Riley Burner
Btu Content of Fuel:	1,525	2,000	1,219	—	360	850–1,000	1,510
As Received	12,400	14,250	12,400	11,000	13,000	11,500	12,600
Dry Basis	12,815	14,800	12,816	—	13,600	13,300	12,724
Inlet Gas Temperature (°F.)	975	975	975	600–800	1,000	600	900–1,100
Outlet Gas Temperature (°F.)	200	200	200	200	550	110–120	200
Temperature of Dry Coal (°F.)	110	110	110	100	300	100–120	150
Through Volume of Air (CFM)	32,000	38,000	23,000	25,000	10,350	32,000	4,070
Maintenance Schedule:							
Automatic Controls	Semi-Annually	Semi-Annually	Semi-Annually	Monthly	Daily	Daily	—
Dryer	—	—	—	Weekly	Weekly	Daily	—
Furnace and Stoker	Monthly	Monthly	Monthly	Monthly	Weekly	Daily	—
Primary Dust Collection:							
Single Cyclones	—	—	—	—	—	—	—
Multiple Cyclones	Yes	Yes	Yes	—	Yes	—	Yes
Other	—	—	—	—	—	Yes	—
Secondary Dust Collection:							
Dry	—	—	—	—	—	—	Yes
Wet	—	—	—	—	—	—	—
Disposition of Dust	—	—	—	—	—	To Product	To Fuel
Disposition of Scrubber Effluent	—	—	—	—	—	—	—

"Fires, caused mainly by worn, leaking shelves" are the primary causes of delay at Mine R.

At Mine S it is reported that "breakage of links in chain of feed conveyor and wear" are responsible for major delays.

Mine T reports, "No particularly mechanical delays are encountered; an occasional operational delay is caused by overheating. No normal delays experienced."

The major item of delay at Mine U is reported as, "removal of oversize coal interrupted by rock stopping rotary valve."

Reduction in Maintenance Costs

To the question, "If you have made any reduction in your thermal drying maintenance costs, how has this been accomplished?" the following comments were made.

At Mine A, "the installation of vacuum cleaning equipment" had helped.

"The use of stainless steel troughs for screw conveyors" reduced maintenance costs at Mine I.

"Mine R reported that mild steel shelves had been replaced with stainless steel."

In Conclusion

It will be realized by all who study this report that it can only be considered a progress report. Technology is advancing rapidly in the field of thermal drying and what is good practice today may be obsolete tomorrow. The foregoing report, then, should be considered as the picture at only one time in history. None the less, the report is important. It does give a picture of practices in the operation and maintenance of thermal drying installations—a picture that until now has not been presented.

Wheels of GOVERNMENT

As Viewed by HARRY L. MOFFETT of the American Mining Congress

As this is written Congress is in the throes of an adjournment rush. Weary solons are shooting for a quitting date of August 24 but the chances seem faint that this will be met. Experienced Washington observers are of the opinion that Congress will finally depart for the hustings shortly before Labor Day.

Little in the way of major legislation, outside of appropriations measures, has been enacted in the first session of the 84th Congress. However, much spade work has been done by committees, and the calendars of both Houses are loaded with measures which can be considered at the outset of the next session. At the convening of the second session, all measures remain in their same status as upon adjournment of the present session.

Congress so far has not made any headway on the drafting of a national minerals policy. It has before it the proposals of the Administration, and while mining State legislators have voiced approval of the proposed tariff relief for the lead and zinc industries, they have viewed the other mineral proposals with a jaundiced eye and are expected to attempt to secure passage of a stronger mining program at the next session.

The so-called price discrimination bill is still locked up in a Senate Judiciary subcommittee, and the pre-merger notification measure remains in a House Rules Committee pigeonhole. Strong efforts will probably be made by proponents to secure action on them next year.

GAS BILL DEFERRED

In mid-August, Speaker Sam Rayburn (Dem., Tex.), ardent advocate of less controls over natural gas producers, announced that the Harris-O'Hara bill to free gas producers from utility-type regulation by the Federal Power Commission would not be considered by the House prior to adjournment. This announcement came after a number of polls had been taken by both parties, all of which indicated that the measure might be defeated if brought to a floor vote at the session's end.

Rayburn made it plain that he has not given up the fight for the bill and said that it will have a "much better chance" of House approval at the next session. He stated that the nerves of members were "a little unstrung" after seven months in session, thus making it difficult to bring up the highly controversial measure.

Rep. Harris (Dem., Ark.), author of the bill, expressed the belief that it could be passed next year.

Coal industry officials teamed up with representatives of mine labor, domestic gas consumers, and with some railroad leaders in a successful drive to secure defeat of the bill if it were brought to a vote. During the Congressional recess they will continue to make their position known on the bill while members of Congress are at home. It is expected that the bill will touch off a bitter floor fight when it is called up at the next session.

TAX RELIEF NEXT YEAR?

Tax relief will become a major issue in 1958. Prospects are for much jockeying for political advantage in moves to cut taxes and tighten up some so-called loopholes in present laws.

The Administration, aghast at the furore created over the huge Federal budget during the current session, is taking steps to slash outlays and to present Congress with a balanced budget and a request for some tax cuts early next year.

Meanwhile Chairman Jere Cooper (Dem., Tenn.), of the House Ways and Means Committee, reflecting the thinking of the majority party in Congress, has announced January 7 as the starting date of broad hearings on general tax revision, including the effect of present tax burdens. Speculation is rife that these hearings will pave the way for cutting individual income taxes, possibly beginning July 1, 1958.

Since next year will see Congressional elections throughout the country, the legislators have their eyes glued to the ballot boxes and will seek to trim taxes where most votes can be gained. The sentiment in Congress not only lies in the direction of reductions to help the smaller wage earners but of cuts in tax rates on higher income brackets to restore incentive for investment.

★ ★ ★ ★ ★ ★ ★

Washington Highlights

CONGRESS: Heads for home.
GAS BILL: Shelved until next year.
TAXES: Extensive hearings next session.
FREIGHT RATES: Hiked again.
STOCKPILE: Study under way.
MINE SAFETY: Hearings end.
OIL IMPORTS: Voluntary curbs renewed.
MINERAL POLICY: Off until 1958.
LEAD-ZINC TARIFF: Stalemated in Congress.

★ ★ ★ ★ ★ ★ ★

FREIGHT RATES BOOSTED

The Interstate Commerce Commission has authorized the nation's railroads to hike freight rates approximately 7 percent within and between Eastern and Western territories and 4 percent within, from and to Southern territory. The Commission also made permanent the 5 to 7 percent interim increases authorized some months ago.

This latest action of the ICC authorizes over-all increases, including the interim hikes, totaling 14 percent in Eastern territory, 12 percent in Western territory and between Eastern and Western territories, and 9 percent within, from and to Southern territory. The increases are estimated to yield about $898 million annually.

Exceptions authorized by ICC included a flat increase of 15 cents per net ton on coal, except for a 10 cent increase on coal for export, and an increase of 7 cents a ton on lignite. Hold downs were also set on coal and coke moving by rail and water. Phosphate rock and salt were made subject to hold-downs of 40 cents per net ton and potash to a hold-down of 75 cents per net ton.

ODM TO MAKE STOCKPILE STUDY

A review of strategic and critical materials stockpile objectives is in the offing. It is understood that the Office of Defense Mobilization will

undertake such a study in the next few months, based on new defense concepts that a three-year rather than five-year national stockpile will be needed to meet requirements of a future national emergency.

The possible impact of such a study upon the mining industry is readily apparent. Both long and short range stockpile objectives for many minerals have been met and in the case of other minerals the shortened requirement period might mean that these goals would likewise now be filled or exceeded. ODM Director Gordon Gray has already indicated that purchases of lead and zinc for the stockpile will probably be brought to a halt when the objectives are met.

Any changes calling for lowered stockpile goals would also pose another problem. Existing minerals expansion programs call for Government purchase (under the Defense Production Act) of some excess output that cannot be sold in the commercial market.

The ODM study results are likely to come under careful scrutiny by Congress when it returns, for many of the measures introduced as facets of a long-range minerals program call for an increased tempo in stockpile buying.

MINE SAFETY HEARINGS HELD

A House Labor Subcommittee on Safety and Compensation recently held two hearings on pending bills which would authorize Federal inspection of metal and nonmetallic mines. Following the hearings, Chairman Roy Wier (Dem., Minn.) told reporters that no action will be taken on the bills until next year. He did indicate that the subcommittee favored approval of the measures.

At the first hearing, representatives of mine labor contended that the accident situation in metal mining is "extremely serious." They also stated that the silicosis hazard is great and that steps are needed to combat it.

Industry witnesses submitted their views at the second hearing, and all of them opposed the adoption of the bills, stating that safety records in non-coal mines are excellent and that safety controls should continue to be a matter of State jurisdiction. Almost all mining associations in metal and nonmetallic mining areas went on record opposing the measure.

Testifying on behalf of the American Mining Congress, Orr Woodburn, director of the Globe-Miami Rescue and First Aid Association, said establishment of a Federal inspection program would duplicate functions of the States without improving on the effectiveness of the present mine safety and health measures. He pointed out that adoption of any of the pending proposals would only complicate present processes because conditions and circumstances under which mining is done in the United States differ in various areas and require local handling. He emphasized that it would be impossible to write rules and regulations, as required under the proposals, which would apply equitably.

Charles E. Schwab, Kellogg, Idaho, testifying both for the American Mining Congress and the Idaho mining companies, pointed to the steady progress being made in mine safety by the industry and declared nothing should be done which would jeopardize this progress. Franklin G. Pardee, president, American Iron Ore Association, stated that education, not Federal inspection, is the key factor to improving the already high safety record of the mining industry.

OIL IMPORT CURB SOUGHT

A Special Cabinet Committee report, arrived by the President, calls for a voluntary reduction in crude oil imports without any limitation on refined products. This plan thus does not provide any restriction on residual oil imports which have proved so harassing to domestic coal and independent oil producers.

The voluntary plan calls for restricting total U. S. imports of crude to 1,031,000 barrels per day rather than the 1,245,000 barrels which had been scheduled for importation. Imports to East and Gulf Coasts are to be limited to 12 percent of domestic production instead of the 16 percent scheduled by the importers. Individual limits were set for several major oil importers, ranging up to 22 percent below their planned imports. Several of these companies have objected to such restrictions and one of them has publicly declared that it will not abide by its quota limit.

Navy Captain M. V. Carson, Jr. has been named special assistant to Interior Secretary Seaton to administer the program, and has instituted a reporting system designed to keep the Government informed as to its progress. He has asked oil importers for compliance with the voluntary program, and while receiving replies from most that they wished to have hearings on the quotas set, one major importer said that it would not comply and charged that the voluntary program is contrary to the anti-trust laws and the principles of competitive enterprise.

MINERAL POLICY DEVELOPMENTS

The Senate Interior Committee has held brief hearings into the second segment of the Administration's proposals from a long-range minerals program—namely those recommendations that would step up research activities, provide Federal financial aid to assure continued production of beryl, chromite and columbium tantalum, and stimulate exploration for minerals.

Industry witnesses testifying before the Committee were critical of several phases of the proposed program. They stated that the provision dealing with Federal mineral exploration assistance which requires certification by a mining company that it is unable to finance the proposed exploration work and that it cannot obtain funds from commercial sources for this purpose, would make it impossible for a large number of companies to conduct exploration activities along the same lines that have been possible under existing law.

The Committee was urged by industry spokesmen to renew tungsten purchases as provided under Public Law 733 of the 84th Congress, to find ways and means to keep fluorspar, manganese, molybdenum and vanadium mines operating, to increase the Government price for newly-mined domestic silver, to intensify research on metals and minerals, to raise the present 24-cent "peril point" on the restoration of the copper excise tax to a more realistic level and hike the present 1.7 cent import tax, and to increase the Government-suggested prices for chrome to the level paid by GSA in 1956.

No action was taken by the Committee. It is expected that the Committee will have thorough studies made of the status of the domestic mining industries during the Congressional recess and will hold lengthy hearings at the next session, in preparation for drafting a long-range program intended to insure a sound mobilization base for the minerals needed for our economic welfare.

LEAD-ZINC TARIFF STYMIED

Proposals to provide tariff relief for the lead and zinc industries reached a stalemate in the waning days of Congress. While the Senate Finance Committee acted to approve the Administration's proposal for imposition of a sliding scale import tax on lead and zinc by tacking it on as amendment to a measure to increase tariff protection for mica, the House Ways and Means Committee refused to go along.

Ways and Means Committee chairman Jere Cooper (Dem., Tenn.) sent a letter to the White House in which he said that the President not only has ample authority under existing trade agreements legislation to provide whatever relief he may deem necessary for lead and zinc, but that he can do so in a more expeditious manner than was provided in the proposal submitted by the Administration to Congress.

Cooper told the President that testimony presented to the Committee indicated that the Administration's legislative proposal "is almost iden-

(*Continued on page* 89)

AMC Personals

Merl C. Kelce, the senior executive vice-president of Peabody Coal Co., in mid-July was elected president to succeed the late **L. Russell Kelce.**

T. L. Kelce was named senior executive vice-president.

Merl Kelce has been in the coal business all of his active business life. He became associated with the Sinclair Coal Companies in 1924 and was in active charge of operations of those companies when they were affiliated with Peabody Coal Co. He has been in charge of operations of Peabody Coal Co., since July, 1955.

Merle C. Kelce

T. L. Kelce

O. Gressens

O. Gressens, president of Peabody Coal before it affiliated with the Sinclair companies and chairman of the Finance Committee for the past year, was elected executive vice-president of Peabody.

Donald S. Taylor has been elected vice-president in charge of research of the United States Borax & Chemical Corp. to succeed **G. A. Connell**, now retired.

Charles B. Lang was recently elected president of the Dominion Coal & Steel Corp. and its subsidiaries, succeeding the late **L. A. Forsyth.**

R. B. Henley has retired as comptroller of U. S. Steel Corporation's Oliver Mining Division to be succeeded by **F. Ray Friedley.**

Henley first joined U. S. Steel in 1924 as an accountant for its Michigan Limestone and Chemical Corp. He was named comptroller of Oliver in 1947.

Prior to his new appointment, Friedley was assistant comptroller at Salt Lake City for the Utah Operations of United States Steel's Columbia-Geneva Steel Division.

Walter Hochschild, president of the American Metal Co., Ltd., succeeded **Harold K. Hochschild** as chairman August 1. H. K. Hochschild retired after 44 years of service to become honorary chairman. He will remain a director. On August 1, **Hans A. Vogelstein**, vice-president and treasurer of American Metal Co., became president.

James G. Creveling, formerly superintendent of coal mines for U. S. Steel Corporation's Tennessee Coal & Iron Division, has been promoted to assistant manager of raw materials. Succeeding Creveling in the coal mines position is **James K. Weed. Walter R. Kirkwood**, who has been chief inspector of coal mines, was appointed assistant general superintendent succeeding Weed.

Roger L. Tenney, mining engineer, has recently assumed duties with the Health and Safety Branch of the U. S. Bureau of Mines with headquarters in Duluth, Minn.

The appointment of **Lowell B. Moon** as development manager of Kennecott Copper Corp. has been announced. He will direct the engineering phases of the company's exploration activities. Moon has been with Kennecott since 1952 as district geologist for the northwestern states and Alaska.

W. B. Dancy has been named superintendent of development and control for International Minerals & Chemical Corp.

James P. Flynn was recently appointed superintendent of the Frick Division's Robena No. 1 mine of U. S. Steel Corp. At the same time **George Wydo** was promoted to superintendent of Robena No. 2, succeeding Flynn in that position.

W. Page Morris succeeds the late **George F. Zoffman** as president of the Duval Sulphur and Potash Co. Morris was elected executive vice-president and director of the company last March, shortly before Zoffman became ill.

Paul Weir, chairman of the board of Paul Weir Co., Inc., has been elected to honorary membership in England's Institution of Mining Engineers. Cited for "distinguished attainments" in mining, Weir is one of only four Americans in recent years to win election to the Institution.

Robert L. Campbell has been appointed manager of metal sales for the Western Division of the New Jersey Zinc Co.

Twin Star Industries, Inc., which operates Uranium and Diatomaceous Earth Mines, has announced the appointment of **John S. McNabb, Jr.** in connection with their expansion into other non-metallic mining interest in the Southwest.

McNabb most recently was on the mining engineering staff of International Minerals & Chemical Corp.

Ian K. MacGregor has joined the Climax Molybdenum Co. as vice president of eastern operations.

W. W. Little, mine superintendent at the Copper Queen Branch, Phelps Dodge Corp., has been promoted to general superintendent of the Copper Queen Branch, with headquarters at Bisbee, Ariz. **H. D. Clark**, assistant mine superintendent, has been promoted to mine superintendent, succeeding Little.

George W. Kratz, financial vice president of Pittsburgh Consolidation Coal Co., retired July 31 after a 50-year career with the firm and its predecessors. He continues to serve as a director and member of the Executive Committee. Kratz has been vice president of Pittsburgh Consolidation since its formation in 1945 and became a director in 1948. He has also been a director and officer of 18 subsidiaries and affiliated companies.

Several promotions have been made in the geology department of the Eagle-Picher Co.

Joseph P. Lyden, chief geologist for the company for many years, has announced his retirement on September 30. **Douglas Brockie,** who has been senior geologist in the Tri-State District, has been named chief geologist for the company's domestic operations in exploration. Succeeding Brockie as senior geologist in the Tri-State District will be **Richard C. London.**

In the Illinois-Wisconsin area operations of the company, **William E. Earnt** has recently been promoted to senior geologist.

Robert H. Jacobson, comptroller, has been elected a vice-president of Copper Range Co., and named comptroller of White Pine Copper Co., a subsidiary. **William P. Nicholls,** vice-president and director of White Pine, was named a vice-president of Copper Range, and **George R. McGrath,** plant controller, was elected a White Pine vice-president.

John K. Banville has been elected treasurer of Island Creek Coal Co. Banville was former manager of the treasury department, United States Steel Corp. with headquarters in Pittsburgh.

C. H. Murphey, executive secretary of the New Mexico Mining Association, has retired. He has been succeeded by **William F. Darmitzel.**

The appointment of **Marion Bolton** as manager of mining and milling operations at Shiprock, N. M., for Kerr-McGee Oil Industries, has been announced. Other changes in the firm's uranium management staff include the promotion of **George Cobb** to director of the Uranium Division; **V. L. Mattson** will have charge of research activities with laboratories in Denver, and **Dick Zitting** will direct uranium exploration from the company's Oklahoma City headquarters.

David Ford McCormick, 69, well-known southern Oregon mining consultant, engineer and civic worker died July 14.

Mr. McCormick had a wide range of experience operating mines throughout this country.

Roger William Straus, 65, who retired as chairman of the board of American Smelting & Refining Co. in April, died suddenly July 28.

Mr. Strauss was born in New York City, the son of Oscar S. Straus, Secretary of Commerce and Labor in Theodore Roosevelt's cabinet. He joined A. S. & R. in 1914, was made director in 1916, and was elected president in 1941. He served in that capacity until 1947, when he became chairman of the board, the position from which he retired this year.

Mr. Straus had piloted the company in some of its major developments. His counsel was instrumental in the organization of Southern Peru Copper Corp., and in developing the asbestos deposits at Black Lake, Quebec. Aside from guiding ASARCO in a major broadening of its interest in mining and metal fabricating, Mr. Straus gained world-wide acclaim for his humanitarian interests. He was a co-founder of the National Conference of Christians and Jews, and had served as an officer of the National Foundation for Infantile Paralysis and the National Council, Boy Scouts of America.

His loss will be felt far and wide.

Edmund A. Starling, 69, safety director of the Harlan County Coal Operators Association, Harlan, Ky., since 1946, died July 8. Mr. Starling was a former Kentucky state mine inspector and former safety director of the Blue Diamond Coal Co.

Roy B. Johns, 64, vice-president and sales manager of Freeport Sulphur Co., died July 24 in New York City.

Mr. Johns had been associated with the sulphur industry for more than 40 years, and in recent decades he played an important part in developing new uses and markets for this essential mineral. First joining Freeport in 1915 at the company's original sulphur property at Freeport, Tex., he became superintendent of marine and loading activities, and in 1930, assistant vice-president and sales manager. He was elected to the post of vice-president and sales manager in 1949.

Kershaw Harms, vice-president, American Smelting & Refining Co., died July 12 in New York. He was 58.

Since 1954, Mr. Harms had been general manager of ASARCO's Federated Metals Division, being made vice-president in charge of the division in April of this year.

Charles A. Owen, 74, chairman of the board of the Imperial Coal Corp. and the industry appointee as one of three trustees of the United Mine Workers of America Welfare & Retirement Fund, died in Miami, Fla., July 22, following a prolonged illness.

Born in Marion, Ohio, in 1883, Mr. Owen was an engineer by profession. He entered the coal mining business in 1911 with the formation of the Smokeless Coal Co., near Johnstown, Pa. After the acquisition of several other properties, all the holdings were consolidated as the Imperial Coal Corporation in 1920.

M. F. Tynan, 59, assistant general manager of the Mexican Mining Department of American Smelting & Refining Co., died suddenly on July 8 in El Paso.

Mr. Tynan came to ASARCO in 1925 and was transferred to the Mexican Mining Department in 1927. For the next five years he spent at various locations in Mexico on explorations projects, and in 1932 was made superintendent of the San Pedro Unit. He remained there until 1950 when he assumed the post of assistant general manager of the Mexican Mining Department.

Karl F. Schoew, 86, prominently identified with early coal developments in southern West Virginia, died July 18.

From 1912 to 1917, Mr. Schoew served as vice-president and director of Howard Colliery mines, later sold to the N. & W. Railway Co. He was also president and director of the Mingo Land Co. from 1939 to 1954, and had acted as president of the Turkey Creek Oil & Gas Co. since 1947.

William Graham Duncan, Jr., 71, president of the W. G. Duncan Coal Co. since 1943, died August 8 in Newall, Ky. Mr. Duncan had been associated with the coal mining industry since 1907.

Oliver Opens Screening Plant

Another important link in the extensive ore-beneficiation program of United States Steel's Oliver Iron Mining Division was completed early in July when Oliver's new ore-sizing plant in Virginia, Minn., went into full operation for the first time.

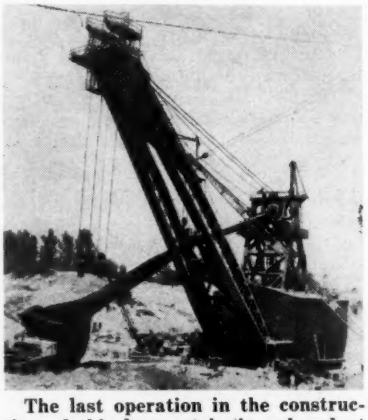
Capable of handling 33,000 tons of material a day, the new addition adjoining the Rouchleau Crushing Plant will treat the direct shipping ores produced in the Rouchleau group, comprised of eight mining properties. The new plant is designed primarily to improve the quality of the ore processed by improving the structure. A similar installation under construction near Chisholm, is expected to be completed this fall.

Both facilities are part of a broad program to increase the adaptability and desirability of Minnesota's ores for blast furnace use and extend the life of Minnesota's iron ore reserves.

The Virginia plant consists of eight screening units. Each unit contains a surge bin, a pan feeder, and two 6 by 12 ft screens in tandem. After the Rouchleau Crushing Plant reduces all oversize ore down to four in., the crushed ore is conveyed to the new plant where the final separation, or rescreening, is made.

Sizing Minnesota ores into "coarse" and "fines" before they are shipped to the blast furnaces helps increase the production of pig iron. Steel men can use the coarse ores in their furnaces just as they receive them. The fines are made usable by first mixing them with ore dust and other metallics and sintered before being charged into the blast furnaces. The lumpy character of the charge permits a free flow of hot gases through the blast furnace with a resulting increase in the production of pig iron.

The End of a Job



The last operation in the construction of this large stripping shovel at Freeburg, Ill., for Peabody Coal Co. was the easing into place of the 70-yd dipper. Construction of this, the largest shovel in the world, was started at Freeburg January 11, 1957, and completed July 26.

Mine Drainage Project Approved

An $850,000 mine-drainage project near Wilkes-Barre, Pa., has been approved by the Department of the Interior. The project is in the Wyoming basin of Pennsylvania's northern anthracite field.

The project, which is a part of a $17 million State-Federal program to relieve mine flooding problems, includes the purchase and installation of four deep-well pumps, each capable of handling 4000 gpm of water. The operation involved is the Buttonwood mine of the Glen Alden Corp., Luzerne County. Unless the water is controlled at a safe level, it will flood the adjoining mines which employ more than 1600 men.

Sentinel of Safety Awards Made

Six mines and quarries in Alabama, Pennsylvania, Michigan and Minnesota have been named winners in the Bureau of Mines' 32nd National Safety Competition for the best safety records in their groups, it was announced recently by the Department of Interior.

The award winning underground metal mine was the Buck iron ore mine of Pickands Mather & Co. near Caspian, Mich., which worked 493,207 man-hours without a disabling injury. The Buck mine also won the trophy in 1952. Winning for underground nonmetallic mines with 277,540 man-hours without a disabling injury was the Bell limestone mine of the Warner Co. located at Bellefonte, Centre County, Pa. This mine won a trophy in the 1955 contest also.

The open-pit mine competition was won by the Embarrass iron ore mine of Pickands Mather & Co. It worked 505,982 man-hours without a disabling injury. The mine is located near Bibwabik, Minn., and won trophies previously in 1949 and 1950. The leading quarry was the Alpena limestone quarry of the Wyandotte Chemicals Corp. at Alpena, Mich., with 474,225 man-hours without a disabling accident. This mine also won awards in 1943 and 1953.

The coal leaders were the Edgewater mine of the Tennessee Coal & Iron Division of U. S. Steel Corp., located at Wylam, Ala., which won the bituminous underground award and the Goodspring mine of the Penag Coal Co., Goodspring, Pa., which won the anthracite underground award. The Edgewater mine had a record of 766,644 man-hours of exposure without a disabling injury, while the Goodspring mine had an injury-severity rate of 0.923 days per thousand man-hours of exposure to win in the anthracite industry.

The mines and quarries established the lowest injury-frequency rate recorded in the 32-year history of the competition.

Reynolds Opens Virginia Plant

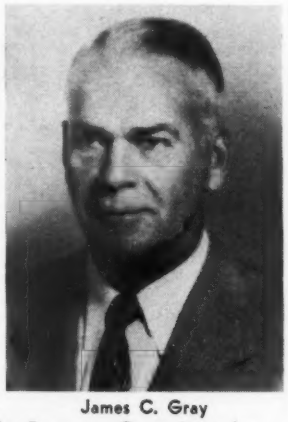
The Reynolds Metals Co. recently opened a new aluminum extrusion plant near Richmond, Va., designed to process aluminum pig and scrap into finished extrusions. The plant was built at a cost of $5,500,000 as a fully integrated plant and at full capacity employs approximately 450 persons.

U. S. S. Curtails Zinc Production

United States Steel Corporation's Tennessee Coal & Iron Division has reduced the workweek in its zinc mines near Jefferson City, Tenn., to four days from five. Curtailment of zinc production was attributed to a decreasing market.

1958 AMC Coal Convention

With the appointment of James C. Gray, Vice President, U. S. Steel Corporation, as Chairman of the Program Committee for the 1958 American Mining Congress Coal Convention, plans are moving ahead rapidly for this important meeting of the coal mining industry. Mr. Gray will head a nation-wide committee of coal mine operators and equipment manufacturers in the important job of selecting subjects and organizing sessions for the Convention. To this group will fall the responsibility of determining how best to bring the industry up to date on the latest advances in methods and equipment for mining and preparing coal.



James C. Gray

Anyone who is interested in having a topic discussed at the 1958 Coal Convention should make his wishes known to the Program Committee by sending suggestions of subjects and speakers promptly to the American Mining Congress, Ring Building, Washington 6, D. C. Early in mid-November the Program Committee will meet to consider suggestions from the industry and draw up an agenda which its members feel will be of widest appeal to the industry.

May 5-7 are the dates for the 1958 Coal Convention and the place is the Netherland Hilton Hotel in Cincinnati. A record turnout is expected and requests for hotel accommodations should be made at once. Write or wire direct to the hotel of your choice.

50 Years of Ore Beneficiation Marked

In Mid-August Iron Ore Mining Industry of Minnesota had a special celebration in commemoration of the golden anniversary of Ore Beneficiation in Minnesota.

The three day industry-wide observance got underway in the afternoon of August 13 when a natural stone monument was dedicated at Coleraine, Minn., to pay tribute to the early pioneers of beneficiation who proved that Minnesota's low grade ores could be improved successfully. The first experimental plant was put into operation by U. S. Steel's Oliver Iron Mining Division on the shores of Trout Lake at Coleraine in 1907.

On August 14, open house was held for iron mining company employees at most of the ore beneficiation plants on the Mesabi and Cuyuna ranges. August 15 was set aside as a day for public inspection of 22 beneficiation ore plants on the two ranges.

Britain's Coal Profits Up

The National Coal Board of England, which operates the nationalized coal mines in the country, announced recently that 1956 was the best year for the coal mines since nationalization ten years ago.

According to the announcement, the mines showed a profit of over $35,000,000 last year on a production higher than in any comparable year since the nationalization. It was also announced that despite the boom in production and profits, prices to consumers will go up this summer to meet rising costs. Domestic consumers of coal pay about $24 a long ton.

Mining Meeting

The Petroleum Society, Mining Society and the Metal Society of the Pittsburgh Section of the AIME, the Engineer Society of Western Pennsylvania, and the Pittsburgh Section of the National Open Hearth Committee will hold their 12th Annual Off-the-Record Meeting at the Penn-Sheraton Hotel, Pittsburgh, on November 1.

Armco Buys Sintering Unit

R. S. Gruver, administrative vice-president of Armco Steel Corp., announced recently that the company had purchased a sintering unit which the Federal Government had leased to the company's Hamilton, Ohio, plant since 1943. Armco and the General Services Administration agreed on a purchase price of $580,000.

The sintering unit was built by the Reconstruction Finance Corp. early in World War II. It is designed to recover flue dust and iron ore "fines" to conserve raw materials and increase furnace pig iron production.

WHEELS OF GOVERNMENT

(*Continued from page* 83)

tical in major respects with the recommendations of the Tariff Commission made to you under the lead and zinc escape clause proceeding in 1954," which was rejected. He also said the situation existing today in the two industries is substantially the same as at the time of the escape clause investigation. He stated that he was greatly concerned over the impact of the Administration's proposal on the whole structure of the trade agreements program. He went on to add that there are many other industries that are asking Congress for relief from import competition, saying "I am confident that you would not want to see the Congress by-pass and undermine your present authority under trade agreements legislation by acting on individual items."

Cooper's stand was supported by the other 14 Democrats on the Committee and had the powerful backing of House Speaker Sam Rayburn.

While the legislation will retain its same standing at the next session, it is apparent that the proposal has developed into a legislative football with the ball now back at the White House for further action. President Eisenhower has indicated that the Administration will entertain a new petition for tariff protection from the industries to the Tariff Commission and that recommendations made by the Commission will be approved by him. The industries made an admirable case for tariff relief in appearances before the Senate and House Committees, and the Government for the first time in more than a decade came to the support of domestic producers over foreign competition. Without action in some form in the near future more domestic mines and plants will be shutting down and not only the mining industry but other segments of the economy will face a dire plight.

Handbook for Uranium Prospectors Revised

"Prospecting for Uranium" is available from the Superintendent of Documents, U. S. Government Printing Office. The booklet, jointly published by U. S. Atomic Energy Commission and U. S. Geological Survey, is 75 cents per copy. The revision includes an enlarged section on the geologic occurrence of uranium based on the large amount of new information developed during the growth of the uranium industry since the earlier edition (1951), information on the domestic uranium procurement program announced in May 1956, latest AEC uranium price circulars and a compilation of laws and regulations affecting uranium mining.

African U-Supply Huge

Geological studies of a large uranium ore deposit in South Africa's Witwatersrand plateau have resulted in estimates of more than a billion tons of ore in the rock of the plateau.

The total value of the uranium, sold exclusively to Britain and the United States through a joint Government agency, is secret, but the mines produced 4400 tons of uranium last year. The production rate is now at more than 5000 tons per year.

Twenty-five gold-mining companies are licensed to work the uranium. Their working profits last year were $70,000,000 or half the total working profits from gold mining. Three years earlier uranium profits were $22,000,000. The Union's uranium industry started secretly as a gold-mining by-product less than five years ago.

Now Cleaning Fine Coal at Gary

The new fine coal cleaning system installed at the Alpheus Central Coal Preparation Plant in United States Steel's Gary, W. Va., district, has been put in operation. The addition of the fine coal cleaning system, designed to improve the quality and uniformity of the plant product, enables the Gary District to wash all of the coal mined in the district before shipment to corporation steel producing plants. Heretofore only the coarse coal, approximately 50 percent of production, was cleaned at the Alpheus.

A further addition to the Preparation Plant, a thermal drying unit, will be placed in operation sometime later.

New Copper Refinery in East

The Reading Metals Refining Corp. announced recently plans for the construction of a new copper refinery near Reading, Pa. The plant will be the first copper refinery to be built east of the Mississippi River in more than half a century.

It is expected that the new plant will have an initial capacity of 1200 tons of refined copper a month. It represents an investment of about $4,000,000 and covers 100,000 sq ft on a 16-acre site. Seventy-nine additional acres are available for expansion purposes. The installation will consist of two main buildings—the casting house and the tank house.

The plant will meet all of the copper needs of the company's parent concern, the Reading Tube Corp.

Options Pennsylvania Coal Land

The Barium Steel Corp. recently obtained from a Pennsylvania Railroad subsidiary a five-year option to lease for 15 years approximately 5700 acres of coal land in Washington County, Pa.

The steel company operates plants in Harrisburg, Phoenixville and Chester, all in Pennsylvania, and under the lease would be required to begin mining operations within 18 months from the date of leasing.

A mine capable of producing a minimum of 500,000 tons annually is planned if exploration on the land under option indicates that the quality of the coal is good and there is enough of it.

Haile Mines, Inc. Expands

W. Lunsford Long, president of Haile Mines, Inc., recently announced that the board of directors of Haile Mines had authorized the purchase of Frank Samuel & Co., a 68-year-old mineral, metal and chemical export-import firm and refractories manufacturer of Philadelphia.

Under the agreement, Frank Samuel & Co. will be operated as a wholly-owned subsidiary of the Haile company. Frank Samuel & Co. was organized in 1889 and is interested in the importation of iron, chrome, manganese, columbite and tantalite ores and non-metallic minerals such as zircon, rutile, beryl, lithium and fluorspar.

William A. Weaver, president of Samuel, will become vice president and a director of Haile Mines and will continue to direct the Samuel operations. Refractories Corp. of America, a subsidiary of the Samuel company, is one of the largest independent companies in the country specializing in chrome cements, plastics and castables for the steel and utility industries.

This will mark the first entry of Haile Mines into a business outside of government-subsidized metal markets and significantly aid product and market diversification, the Haile president commented.

Uranium Plant Completed

Work has been completed on an Atomic Energy Commission uranium refinery at Weldon Springs, Mo., and it has been turned over to the operating contractor.

The refinery is a part of a $44,000,000 project which is near completion. Remaining work includes the completion of the "green salt" and metal plants and laboratory and pilot plant units.

North Carolina Emerald Mine Reopened

W. B. Thweet, of Augusta, Ga., president of the recently incorporated Little Switzerland Emerald Mines, Inc., has announced plans for the reopening of an emerald mine near little Switzerland, N. C.

The mine was discovered about 1855 and was operated under lease by the American Gem & Pearl Co., of New York City, until 1904. It was reopened for testing in 1919, 1935 and 1942. It has three shafts with only one of them worked to any great depth.

The lease to the new corporation includes mineral rights on some 200 acres and includes mica and feldspar deposits as well as the emerald mine.

St. Joseph and Bethlehem to Mine Iron Ore

St. Joseph Lead Co. and Bethlehem Steel Co., have joined forces to form the Meramec Mining Co., to develop and mine a large deposit of magnetite and hematite near Sullivan, Mo. Preparations are now being made to sink a 3000-ft shaft on the property. It is expected that the shaft work will get under way September 1.

Sometime this fall Meramec Mining Co. expects to establish offices at the plant site. L. L. Bilheimer has been appointed resident manager of the new company.

Safety Award

On Saturday, July 27, the second quarterly safety meeting of the Old Ben Coal Corp. was held at the Franklin County Country Club, Franklin County, Ill. The feature event of the meeting was the presentation of a Joseph A. Holmes Safety Association Certificate of Honor Award to Old Ben Coal Corp. Mine No. 9. This mine produced 1,127,246 tons of coal without a single lost-time accident during the period February 25, 1956, to October 18, 1956. This production represents 306,073 man-hours of exposure. Statistics show that in the industry as a whole for this production there was one fatal accident and about 30 lost-time accidents during 1956.

Shown in the picture above (l to r): (standing) J. A. O'Connor, assistant supervisor, U. S. Bureau of Mines, Vincennes, Ind.; Byrd Rich, Local Union president, Mine No. 9; Ted Mitchell, president, Sub-District No. 5, United Mine Workers of America; George Stachura, superintendent, Mine No. 9; Paul Tisdale, safety engineer, Old Ben Coal Corp.; Howard Lewis, vice-president in charge of operations, Old Ben Coal Corp.; and William C. Campbell, assistant vice-president in charge of operations, Old Ben Coal Corp. Seated are H. C. Herrin, mine manager, second shift, Mine No. 9, and John Sharkness, mine manager, first shift, Mine No. 9

Interior Estimates Iron Ore Reserves

The United States has about 75 billion long tons of crude iron-ore resources, according to a recent estimate by the U. S. Geological Survey. This is an increase of more than 25 billion long tons since the last summary of iron-ore resources was published in 1955, and results from further exploration and more complete information and also from the inclusion of additional low-grade material in the Lake Superior region.

The Lake Superior and Southeastern regions have the major share of reserves (84.8 percent) and potential ore (about 95 percent), and must continue to produce the greater part of our domestic iron ore.

According to the report, "resources" include both "reserves," ores exploitable under existing conditions, and "potential ore," material not exploitable under present economic and technologic conditions. About 10 billion long tons of the 75 billion are classed as reserves; direct-shipping ores and concentrates obtainable from low-grade ores total about 5½ billion long tons. The remaining 65 billion tons, which is potential ore, probably could yield some 25 billion long tons of concentrates and a little direct-shipping ores.

The estimates were compiled from published sources and information in the files of the Geological Survey, the Bureau of Mines, and from individuals, companies and state officials.

International Coal Conference

During the week of June 23-28, 1958, the Third International Coal Preparation Congress will be held at Liege, Belgium. Coal Preparation men from all over the world will meet to hear and discuss papers on fine coal cleaning. Papers will be heard in three languages—German, English and French—with simultaneous translations. Detailed information on the congress can be had from the Institut National de l'industrie Charbonniere (Inichar), 7 Bd Frere-Orban, Liege, Belgium.

PERLITE AND OTHER LIGHTWEIGHT AGGREGATES

(*Continued from page* 74)

overcome in the past several years by the development of mill mixed plaster. The introduction of this product and the aggressive merchandising efforts of the major gypsum companies have pushed demand for perlite higher each year.

Perlite lends itself to the preparation of very lightweight insulating concrete. Perlite concrete with a dry density of as low as 20 lb per cu ft can readily be made. This is widely used for poured perlite concrete insulating roof decks. Perlite is used in structural concrete at compressive strengths up to 2000 psi, with unit weights up to 60 lb per cu ft. In combination with sand or heavier aggregates, the entire range of strength and densities up to conventional concrete may be made. In certain sections of the country, lightweight concrete blocks are made from perlite aggregate.

Perlite plaster and perlite concrete are used extensively in fireproofing steel columns in modern skyscraper design. Perlite concrete lends itself to sprayed on construction as in modern curtain wall design.

One fast growing use of expanded perlite is in oil well cementing. Here the lower slurry weights permit cementing deeper wells without excessive pumping pressures. Perlite aggregate in oil well cement and in drilling mud is an effective means of bridging porous formations.

Expanded perlite with bulk densities below four lb per cu ft is widely used as loose fill insulation in connection with liquid air and similar very low temperatures. Here it has been shown to be one of the most effective materials available.

In the past year a number of concerns manufacturing preformed insulation blocks and pipe covering have begun to use expanded perlite in carload quantities as a component of their formulations. Refractories for medium temperatures are being made from perlite.

A new and growing use for expanded perlite is in industrial filtration. In the past two years, three or four concerns have undertaken the manufacture of filteraids by controlled milling of expanded perlite. This outlet for perlite now amounts to about 20,000 to 25,000 tons per year.

The Perlite Institute estimated in 1955 that 70 percent of U. S. production of expanded perlite was used in plaster, 20 percent in concrete, with the remaining ten percent distributed among the above-described miscellaneous uses.

Adequate Reserves for Many Years

Many deposits of perlite have been discovered in recent years. Because of a number of factors, comparatively few have any commercial significance.

Because of the low value of prepared perlite which sells for $6 to $11 f.o.b. the mine, the favorable location of any deposit with respect to rail transportation and to the urban markets is a prerequisite to commercial exploitation.

Then too, during the past few years the industry has become more sophisticated. Not only must the ore be capable of expansion at high furnace production rates, but the characteristics of the expanded product must meet exacting standards.

A deposit suitable for use as an aggregate might not be competitive for another end use.

While no published data exists on perlite ore reserves, geologists and mining engineers associated with the industry point to several deposits known to contain hundreds of millions of tons of reserves — adequate for U. S. requirements for many years.

Bureau of Mines Announces First Aid and Rescue Contest

Rules for the 1957 National First-Aid and Mine Rescue Contest to be held in Louisville, Ky., October 2, 3, and 4 were announced recently by Marling J. Ankeny, Director of the Bureau of Mines of the Department of the Interior and general chairman of the safety event.

Ankeny said procedures will require first-aid teams to work at least ten problems. Mine rescue teams, which will be equipped with self-contained oxygen breathing apparatus during the maneuvers, will work one or more problems in a mock mine set up at the contest site, the Kentucky Fair and Exposition Center, Louisville.

The rescue contest will begin at 9 o'clock the morning of October 2 and continue until all teams have completed their tests. The first-aid events begin at 9 a. m., October 3 and continue through the day. They will resume at 9 a. m., October 4 and will end about noon. Contest winners will be announced at a banquet in Louisville the night of October 4.

The Bureau of Mines is making copies of the rules and entry blanks available through its Health and Safety offices in coal-producing areas as well as through Harry F. Weaver, contest secretary, 4522 Interior Building, Washington, D. C.

Teams from all segments of the mineral industry are eligible and are urged to compete in the contest.

Jersey Ilmenite Studied

Rutgers University scientists are studying the economic possibilities of ilmenite deposits which were found last fall in an area between Camden and Lakewood, N. J. The deposits are about ten miles wide and further explorations are being made.

Tests are being made at Rutgers to determine the mineral content of the sand in the area of the ilmenite deposits. These have shown that rutile and zircon also occur in the area.

AEC Sees Doubling of U-Oxide

A doubling of domestic production of uranium oxide by the end of 1958 was envisioned by the Atomic Energy Commission in its 22nd semi-annual report to the Congress.

The AEC said that the production of uranium oxide concentrates during the first half of 1957 total 4200 tons compared with 3400 tons for the last half of 1956 and 2600 tons for the first six months of 1956.

According to the AEC, ten more processing mills are under construction or on the planning boards while the 12 now in operation have a capacity of 9210 tons of raw uranium ore a day. It is expected that the mills handle a total of 18,305 tpd of ore.

Annual Coal Division Conference

Pittsburgh, Pa., Friday, November 15, 1957

COAL MINING MEN, manufacturers of mining equipment, suppliers to the industry, and all other persons interested in the mining of coal are cordially invited to be on hand November 15 at the Penn-Sheraton Hotel in Pittsburgh for the annual conference of the American Mining Congress' Coal Division. The six technical committees of the Coal Division will report on work that has been completed this year and will recount the progress of current studies. Primary purpose of the meeting is to outline the work of the various Coal Division committees and subcommittees and to encourage the free interchange of information that is so important to advancing technology in an industry.

In their work of developing and disseminating data on problems vital to the industry, the Coal Division studies the practical application of mining machines and methods to determine what is required for successful operation under widely varying conditions. The broad range of subjects to be covered at the November 15 meeting includes: Operation and Maintenance of Thermal Drying Equipment; Washery Water Clarification; Dust Control for Continuous Mining; Industrial Engineering; Roof Bolting Pattern Changes; Temporary Cable Splices; A-C Power System; Conveyor Installation, Operation and Maintenance; Rail Haulage, Operation and Maintenance, and Haulage Safety Practices.

Committees and their chairmen are:

Committee on Coal Preparation
R. L. LLEWELLYN
Eastern Gas and Fuel Associates

Committee on Conveyor Haulage
H. A. JONES
Carbon Fuel Company

Committee on Mechanical Mining
WM. E. HESS
Jones & Laughlin Steel Corporation

Committee on Rail Haulage
J. D. REILLY
Hanna Coal Company, Division of Pittsburgh Consolidation Coal Company

Committee on Roof Action
J. A. BROOKES
Mather Collieries, Pickands Mather & Co.

Committee on Underground Power
J. A. DUNN
Island Creek Coal Company

Plans Underwater Salt Mine

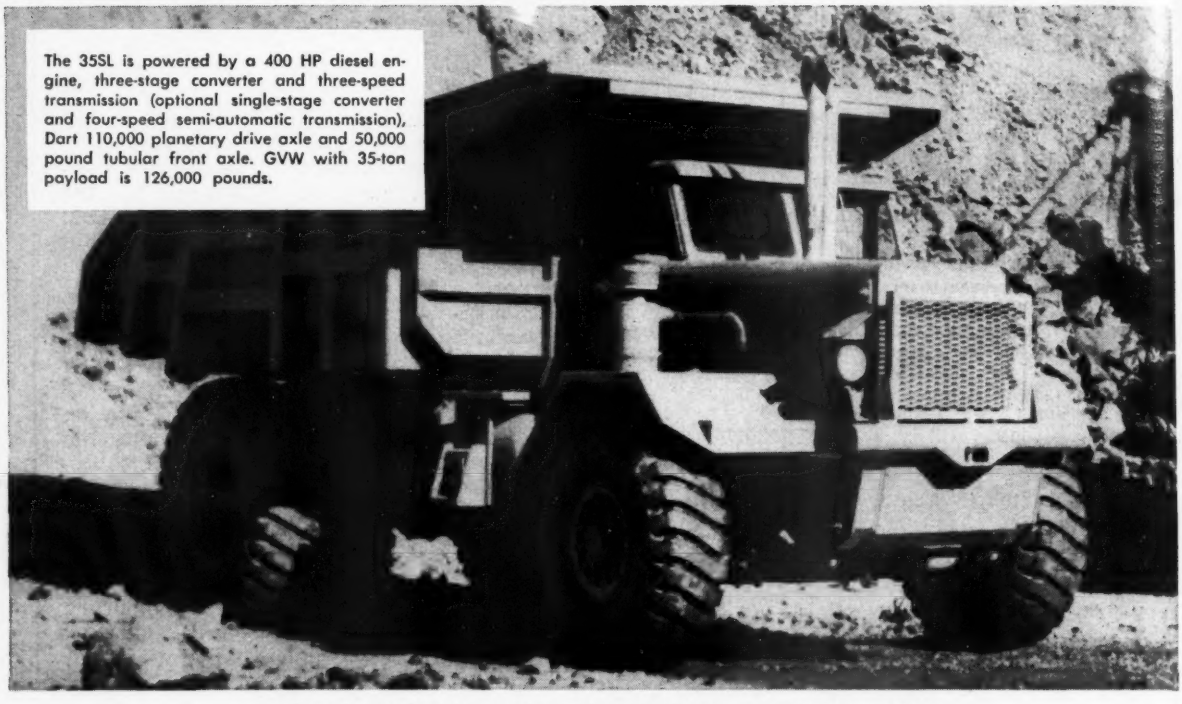
The International Salt Co. has made tentative arrangements with the State of Ohio to mine salt under Lake Erie off-shore from Cleveland. The contract has been approved by the Ohio Natural Resources Commission.

The terms of the contract provide for the mining of 5193 acres as long as the company finds the venture economically feasible. The State would be paid an annual fee of $6491 and a royalty of five cents per ton for all salt mined over 129,825 tons.

Preparation Plant Completed

A new coal preparation plant has been completed and put in operation at Goody, Ky., by the Osborne Mining Corp. The washer of the plant is of the dual gravity media type and prepares two grades of coal in several sizes and blends depending upon the market demand, according to company officials.

The company now loads coal from three tracks and also operates a bucket line to the Norfolk & Western coal wharf.



The 35SL is powered by a 400 HP diesel engine, three-stage converter and three-speed transmission (optional single-stage converter and four-speed semi-automatic transmission), Dart 110,000 planetary drive axle and 50,000 pound tubular front axle. GVW with 35-ton payload is 126,000 pounds.

WHAT THEY ARE SAYING ABOUT THE

DART 35SL

AFTER THE FIRST YEAR

SUPERINTENDENTS: *"Costs are down . . . Hauls a big load . . . And on two axles, highly manueverable . . . Lots of power . . . Less tire wear."*

MASTER MECHANICS: *"Rugged construction . . . It can take it . . . Less parts to maintain . . . Easy to work on."*

DRIVERS: *"Easy to steer . . . Very stable . . . Excellent visibility . . . Quick spotting under shovel."*

Dart 25SL powered by a 300 to 335 HP diesel engine, three-stage torque converter and four-speed transmission (optional single-stage converter and four-speed semi-automatic transmission), Dart 100,000 pound planetary drive axle and 25,000 pound tubular front axle. GVW with 25-ton payload is 97,000 pounds.

Dart 50T powered by a 400 HP diesel engine, three-stage converter and three-speed transmission (optional single-stage converter and four-speed semi-automatic transmission), Dart tandem planetary rear axles of 100,000 pounds capacity each, and front axle of 35,000 pounds capacity. GVW with 50-ton payload is 180,000 pounds.

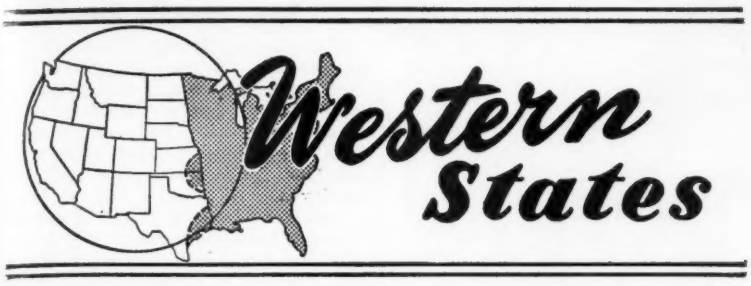
POWER for the Climb—SPEED for the Haul Road

HEAVY DUTY TRUCKS EXCLUSIVELY SINCE 1903

DART TONNAGE ENGINEERED TRUCKS

Kansas City 8, Missouri

SUBSIDIARY OF THE CARLISLE CORPORATION



Idaho Mining Association Officers Named

Wallace G. Woolf, vice-president of the Bunker Hill Co., Kellogg, was elected president of the Idaho Mining Association at its annual convention at Sun Valley in July. He succeeded L. E. Traeger, superintendent of the Anaconda Company's phosphate operations at Conda.

Another Coeur d'Alene district man, L. J. Randall, president of Hecla Mining Co., Wallace, was named first vice-president, and E. B. Douglas, general manager of Calera Mining Co., Cobalt, was chosen second vice-president. Harry W. Marsh of Boise was re-elected secretary-treasurer.

Directors for the coming two years are H. L. Day, Wallace, president, Day Mines, Inc.; M. C. Brown, Kellogg, president, Sidney Mining Co.; C. E. Horning, Wallace, president, Lucky Friday Silver-Lead Mines Co.; Brad Johnson, Kellogg, manager, Sunshine Mining Company's Sunshine Mine; J. C. Kieffer, Wallace, general manager, American Smelting & Refining Company's northwest mining department; Robert R. Porter, Boise; and R. R. Rumer, Soda Springs.

Skip Will Widen Liberty Pit

The Nevada Mines Division of Kennecott Copper Corp. have started work on a new $1,500,000 skip haulage system to remove ore and waste material from its huge Liberty pit. The installation, designed to improve operating efficiencies, increase production and help the division remain competitive in the copper mining industry, is scheduled to be completed in the second quarter of 1958.

Excavation for the skipway, hoist house and new rail yard will be undertaken in the near future. Total excavation, which will be accomplished by Kennecott equipment, will require the removal of 2,000,000 tons of earth. Bids are expected to be placed for fabrication and installation of the skip haulage equipment at an early date.

The installation will make extensive fringe ores on the perimeter of the Liberty pit available to open-pit mining methods. Necessary stripping of overburden to recover the fringe ores will be started simultaneously with the installation of the skip system.

The new hoist or skip installation will consist of two parallel tracks running down the side of the pit to the bottom. On each of these tracks will be mounted a 35-ton ore carrier which will work in balance.

At the edge of the pit will be a structure similar to the head frame of an underground mine which will contain the bins from which ore will be loaded into the railroad cars for transportation to the reduction plant at McGill. Behind the head frame will be the customary hoist house containing the large motors capable of raising the 35-ton loads of ore and waste.

It is planned to install three loading points at various elevations along the tracks so that truck haulage units can most effectively dump the ore and waste into skips for removal to the pit rim.

Lime Plant Near Las Vegas

Construction of a new $2,000,000 industrial lime plant at Arrowlime, 19 miles northwest of Las Vegas, Nev., has been announced by United States Mine Products Corp.

To have capacity of 400 tons per day, the plant will include two rotary kilns. Lime flux and lime products for the steel and chemical industries will be manufactured at the plant which is expected to be completed in November.

Borax Plant Nears Completion

The $18,000,000 borax production plant of Pacific Coast Borax Co., Division of U. S. Borax & Chemical Corp., at Boron, Calif., is nearing completion. The project includes production facilities for borax and other borate products, as well as packing and shipping facilities.

Four massive thickener tanks, slated to be the largest covered and insulated tanks of their type in the world, are included in the project.

Vitro to Work Wyoming Uranium Claims

Vitro Minerals Corp. has contracted to develop and mine a series of 51 uranium claims owned by Shoni Uranium Corp. in the East Gas Hills district of Wyoming. The agreement covers four groups of claims, including the so-called Jackneese and Blackstone claims and the Sage Hen lease, located in Fremont and Natrona Counties.

Vitro has acquired, for an initial period of ten years, the commercially mineable uranium ore in the claims. In return, Shoni will receive an undisclosed sum in cash plus a percentage of the gross sales price received for uranium ore mined and sold from the claims, or, alternatively, a share of the annual net profit from the mining operations.

Vitro has also purchased nine additional uranium claims and acquired options to lease 36 other claims in the same general area of the Gas Hills, and has acquired one year options to lease 21 claims of the Hughes Mining Co. group and 15 claims of the so-called H & S group in the East Gas Hills.

Vitro Minerals Corp. is owned jointly by Vitro Corporation of America and Rochester & Pittsburgh Coal Co.

Turkeys Are Safety Awards

Employes of Kennecott Copper Corporation's Chino Mines Division, New Mexico, will have a chance to win a Christmas turkey in a division-wide safety competition which began August 1. The contest is matching employes of the Santa Rita plant against those at Hurley—everyone will be competing against the record books.

The contest will close December 15. At that time the plant having the best improvement in its accident frequency record will be declared the winner and turkeys will be given to employes on the winning side. Those having a lost-time accident during the period of the contest will be ineligible for the award.

Records will be compared with those of 1955 and 1956 for the period August 1 to December 15.

Nevada Mines Shut Down

Wah-Chang Mining Corporation's Lincoln Mine at Tempiute, Nev., was closed on August 1, putting almost 200 men out of work; the closure of Combined Metals Reduction Company's lead and zinc mine at Castleton, Nev., leaves another 150 men unemployed.

The Wah-Chang operation is one of Nevada's three major tungsten producers, and Combined Metals, a Utah firm, is Nevada's largest lead and zinc producer.

Two other Nevada tungsten operators—Getchell Mines and Nevada-Massachusetts—have curtailed operations.

Asarco Pushes Exploration Project

American Smelting & Refining Co. may spend more than $1,000,000 within the next year on exploration of Bethlehem Copper Corporation's Highland Valley property in British Columbia it was revealed at the recent annual meeting of Bethlehem Copper Corp. in Vancouver. Five drills are currently in operation on a two-shift basis, and intensive exploration is in progress on a third mineralized zone located downhill from the already-proven tonnage to eliminate the possibility of covering an ore zone with a waste dump.

To Mine California Tungsten

Atlas Consolidated Mining Co. recently completed first steps in a large venture to recover tungsten and gold from surface deposits in the hills between Johannesburg and Red Mountain, Calif. A 400-ton dredge was towed 18 miles across the desert into the new location.

Actually, the dredge is now only about 6½ miles from where it started. The longer route was chosen to avoid power and coal mines. It took six weeks to travel the 10 miles. Three tractors were used to tow the unit which was mounted on an angle shaped dolly of wheels and landing gear from B-29 bombers.

The company now faces a problem securing sufficient water to operate the dredge and finding a supply of power. Plans are to bring water from four wells recently drilled in Fremont Valley.

The dredge, which has been out of operation since 1943, will handle 3000 yd per day. Estimates are that deposits located so far will allow the dredge to operate for 15 years.

To Expand Zirconium Unit

Wah Chang Corp. will spend $1,000,000 to expand the capacity of its Albany, Ore. zirconium plant to 550,000 lb a year from 400,000 lb it is reed to be in production by early next ported. The added capacity is expected to be in production by early next year.

The current $2,000,000 plant was built in 1956.

Wah Chang also operates a U. S. Bureau of Mines zirconium plant at Albany with an annual capacity of 350,000 lb a year. With the expansion, the combined capacity operated by Wah Chang will total 900,000 lb yearly.

All zirconium currently is sold to the Atomic Energy Commission for use in nuclear reactors.

Who Would Have Guessed!

It is generally known by all good mining men that the introduction of a new piece of equipment or new machine generally brings on unanticipated problems. This certainly happened to be the case in an incident reported by an inspector for the Alaskan Department of Mines recently.

The inspector was visiting a diamond drilling site around the slopes of a rather dry mountain. He found the drillers swearing mightily about not being able to keep the water flowing through a long supply line of the new plastic pipe they had had air-dropped to them. Their troubles were not mechanical but animal. A bear had found the plastic pipe particularly tasty and made periodic visits to chew holes in the pipe line.

Idaho Smelter Marks 40th Year

The Bunker Hill Company's lead smelter at Kellogg, Idaho, this year marked its 40th anniversary of production of lead and associated by-products.

Started in the spring of 1916, the smelter was "blown in" on July 5, 1917. Since that time it has produced 2,500,000 tons of lead, 333,000,000 ounces of silver and 500,000 ounces of gold, as well as 220,000 tons of zinc, 35,000 tons of copper, 26,000 tons of antimony and 1,500,000 lb of cadmium.

Plant capacity today is nearly triple the original rate of output. During its first full year of operation, 1918, the smelter turned out 38,611 tons of lead, compared with the 1956 total of 101,714 tons.

Built at an initial cost of $1,500,000, the big smelting plant is now valued at $20,000,000 based on cost of improvements and increased valuations and probably could not be replaced for that amount.

Originally all ores for the smelter were supplied by Coeur d'Alene district mines, and until 1930 only half of the company's mine production was processed in it, because of contractual agreements with American Smelting & Refining Co. Now however, about 36 percent of the ore must be obtained from foreign sources to maintain metal production at the increased smelter capacity.

Plant improvements are still being made. Modernization projects planned or underway are a new sinter roasting plant, estimated to cost about $2,500,000, a by-product fume plant, and refinery renovations and improvements, including a straight-line lead casting machine and additional refining kettles.

All improvements and additions are designed not only to increase efficiency and production, but also to improve the safety factor for smelter employes.

Three of the employes who were on hand when the smelter started operation in 1917 are still with the company.

Washington Uranium Mill in Operation

Dawn Mining Company's $3,000,000 uranium processing plant at Ford, Wash., has begun full circuit operations. The crusher, with a capacity of 500 tpd, will be operated six days a week, while the mill will operate seven days a week. Rated capacity of the mill is 400 tpd; the full operation will employ about 55 men.

Under the firm's contract with the AEC, the plant must accept 100 tons of ore daily from other producers, although the plant will operate principally on ores now being mined by open-pit methods from Dawn Mining Company's Midnite mine on the Spokane Indian reservation.

Sheep Creek Ore Improves

Sheep Creek Mines, Ltd., has announced that improvement in ore grade at its Mineral King mine near Invermere, B. C., Canada, will permit a continuation of successful operation if lead-zinc prices do not fall below their early July levels.

A new haulage adit (No. 7 level) has been connected with the No. 3 level 700 ft above and better-than-mine-average-grade of ore was encountered in driving both manway and orepass raises. The company reported that mining of this ore will help counteract the effect of the drop in lead and zinc prices.

Diamond drilling from the No. 5 level station has cut the higher-grade ore, and silver values of one ounce to each one percent of lead are indicated, as compared with one-quarter ounce in recent lead shipments.

Lime Flux Plant

United States Lime Products Corp., a subsidiary of Flintkote Co., will construct a new plant on its property at Arrolime, Nev., some 19 miles northwest of Las Vegas, for the manufacture of oxygen steel-making lime flux. The new plant will have a capacity in excess of 400 tons of lime products per day.

U. S. Lime Products has operated a quarry and manufacturing plant at Sloan, Nev., since 1926; a limestone quarry with crushing and screening equipment at Arrolime since 1945, and a manufacturing plant which was purchased by the company in 1949 within the Basic Magnesium project at Henderson, Nev. The corporation also operates quarries and manufacturing facilities in Nelson, Ariz., as well as Sonora, Calif.

Triumph Mine Closed

The Triumph Mine near Hailey, Idaho, a producer of lead, silver and zinc, has been closed, leaving some 60 men without jobs. A skeleton crew will remain on the job for a time to complete salvage operations and to keep the mine pumped out for the immediate future. The company said the mine was closed because the ore reserves are nearly depleted and because of present low prices for its products.

Carbide Buys Uranium Property

Union Carbide Nuclear has exercised its option to purchase Aljob Mining Co. uranium property in the East Gas Hills area of Wyoming. Union Carbide Nuclear made an outright purchase of the property; no royalty payments are included. The Aljob Mine includes 26 claims.

Union Carbide Nuclear has done considerable drilling on the property in the past year and is contemplating additional work.

Golden Cycle Increases Uranium Activity

Golden Cycle Corp. and Giant Resources, Inc., have concluded a joint venture agreement under which Golden Cycle, a Colorado Springs, Colo., gold mining concern, purchased an interest in Giant's uranium properties in the Edgemont, S. D., district and in eastern Wyoming. Operations will be conducted by the newly formed Giant Cycle Corp., in which the two firms will have joint interests, according to Merrill Shoup, Golden Cycle president, and T. R. Gillenwaters, president of Giant Resources. Total acreage currently amounts to some 12,000 acres, on which an intensive drilling program will be underway shortly.

Shoup will be president of Giant Cycle; Max Bowen of Golden Cycle will be executive vice-president and in charge of operations.

Golden Cycle has been looking into the uranium field for about five years and has been developing holdings on Atkinson Mesa in Colorado.

Grace Plans Wyoming Acid Operation

A $2,000,000 sulphuric acid plant will be built at Casper, Wyo., it was announced recently by the Davison Chemical Co., a division of W. R. Grace & Co. The plant is scheduled to go into operation July 1958.

Present plans call for a plant with a capacity of 200 net tons per day. It will use recovered molten sulphur from northwest Wyoming as raw material and will convert spent alkilation acid and hydrogen sulphide from nearby petroleum refineries to sulphur dioxide.

Surcease Tungsten Mine Closes

Surcease Mining Company's tungsten operations in San Bernardino County, Calif., were terminated as of July 9, the company announced. Cleanup millings and shutdown arrangements will require several weeks.

The closing followed Congressional refusal to appropriate funds to carry out a Government tungsten program authorized by Congress last year. Recent production had been entirely under a block-leasing system.

To Develop Oregon Nickel

Nickel Corp. of America, jointly owned by New Delhi Mines Ltd., Toronto, Canada, and Chemical and Metallurgical Enterprises, Inc., Salt Lake City, Utah, is planning to develop nickel deposits in the Illinois Valley area of southwest Oregon. The area is about 80 miles from the Hanna Nickel Mine development at Riddle, Ore.

NCA has already begun final stages of exploration and has four drills working in the area.

Reopen Round Mountain

It is reported that the Mammoth Gold Dredging and Milling Operation at Round Mountain, Nev., closed since the fall of 1952, will be reactivated in the near future by the Fresnillo Co. of Mexico. Stripping is now under way. Much of the old machinery will be replaced and the mill will not be rebuilt. Actual operations are not expected to get under way until the spring of 1958.

The original plant, built in 1950, was designed to handle seventeen thousand tons of gravel per day.

Idaho Tungsten Mine Closed

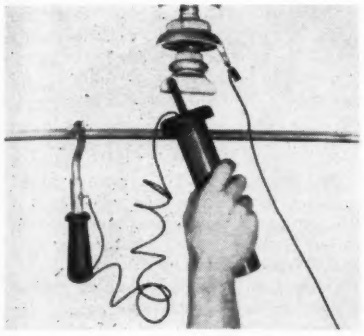
Bradley Mining Company's Ima Mine at Patterson, Idaho, one of the nation's leading tungsten producers in recent years, was closed down as of June 30 as the result of the failure of Congress to appropriate additional funds for the Government tungsten purchase program.

About 50 men were laid off at the end of June, leaving only a skeleton staff of eight employes for maintenance and administrative purposes. The mine had been operated on a curtailed basis since May.

Manufacturers Forum

Insulated Hanger Tester

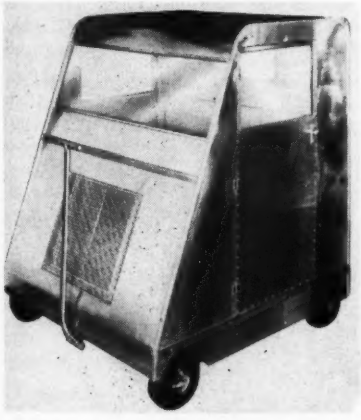
A MINE Hanger Tester for testing insulated mine hangers has been announced by Ohio Brass Co., Mansfield,



Ohio. With it, hangers can be tested on the line, as well as in the shop. The assembly consists of the tester unit, a rubber handled contact hook, and a ground wire with clamps at each end.

Cooling Cab

A PORTABLE cab-type cooling compartment, in which workmen can take refuge at intervals from the extreme heat generated by certain types



of industrial operations, has been placed on the market by the Peuchen Engineering Corp., 1010 Wright St., Wilmington, Del.

Known as the Breeze Wagon Cooling Cab, this piece of equipment is actually an air-conditioned booth on wheels. They are made of aluminum to reflect as much heat as possible, insulated, and air-conditioned by filter air which dehumidifies as it cools. Electrical equipment is dust-proof and explosion-proof. Cooling Cabs will be available in sizes to accommodate two, four or six persons.

Inquiries about new equipment appearing in Manufacturers Forum are welcomed. For additional information on any piece of equipment in this section write directly to the manufacturer, or to Mining Congress Journal with name of item and date of issue in which it appeared.

Tractor-Mounted Rippers

THESE ROCK RIPPERS have an exclusive curbed and tapered shank design that gives tremendous penetration and shattering action, according to the Greenville Steel Car Co., Greenville, Pa. Shanks are cast from manganese-molybdenum alloy steel. Swivel-mounted, they can turn 15° in each direction. Depth and pitch adjustment can be set for each specific job. A three-shank unit weighs five tons—rips to 24 in. Special drawbar replaces tractor drawbar and brackets. Double-acting hydraulic system provides finger-tip control.

Units are for International Harvester TD-14, 18 and 24 tractors.

Steel Grating and Stair Treads

A LINE OF ABRASIVE EMBEDDED steel grating and stair treads is now being marketed under the trade name "Relgrit."

Designed to prevent slipping accidents, Relgrit is said to have a coefficient of friction 30 percent greater than dry steel grating. It is made of embedded abrasive particles baked in deep V-grooves in the tops of the bearing and crossbars of grating.

Relgrit is also said to be non-absorbent and impervious to oil, grease, acids, alkalis and other common industrial chemicals.

More complete information may be had by writing to Reliance Steel Products Co., 3700 Walnut St., McKeesport, Pa.

Rotary Air Compressor

A LIGHTWEIGHT, short-turning rotary air compressor, the Le Roi 600RD2 is rated at a free air capacity of 600 cfm. It is a portable, two-stage, sliding vane-type compressor with a dry weight of 7730 lb and a turning radius of 11 ft 11 in.

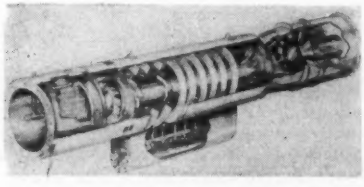
The compressor is coupled to a GM-71 diesel engine with a hydraulically activated clutch. By use of an automatic variable capacity regulator and an automatic governor speed control, engine speed varies to match air demands.

The engine-compressor is supported on a unit welded steel frame and is enclosed in a metal housing. Automative type steering, tapered roller wheel bearings and 7.50 by 16 eight-ply tires reportedly provide easy towing.

For more detailed information write to Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.

Miniaturized Dust-Collector

A CYLINDRICALLY-SHAPED wet type dust-collector, said to be 1/20th to 1/10th the size of any comparable unit and capable of collecting over 99 percent of dust particles five microns and larger in size, has been announced by the Joy Manufacturing



Co. Called the Joy Microdyne Dust-Collector, it is reported to represent an unusual application of certain aspects of wet inertial type collection. Its size, according to the manufacturer, allows installation as part of the duct. Joy will produce the unit in a standard line ranging from 2500 cfm to 64,000 cfm. Special applications will be on a custom basis. basis.

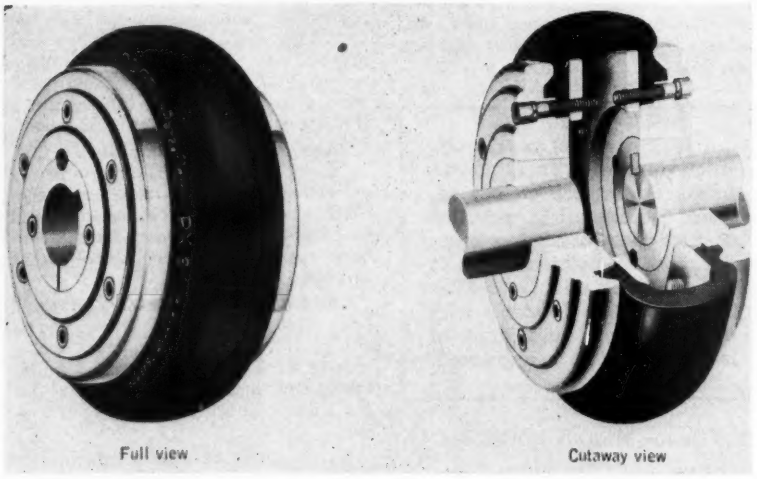
Complete information can be had by requesting booklet JA-616 from Joy Manufacturing Co., Oliver Bldg., Pittsburgh 22, Pa.

Flexible Cushion Coupling

ABILITY TO HANDLE ANGULAR MIS-ALIGNMENT, parallel mis-alignment and end-float, and in any combination, is only one of many advantages claimed for the Para-flex Coupling by the Dodge Manufacturing Corp., Mishawaka, Ind. The flexible member is said to cushion shock loads and diminish torsional vibration, thus protecting both the driver and the driven machine.

The tire has a transverse split molded into it, which reportedly permits easy installation and makes replacement possible without moving driver or driven machine. To make a change the cap screws are loosened enough to allow removal of the tire and to fit a new one in place.

According to Dodge engineers, Para-flex will take angular mis-alignment up to four degrees, parallel mis-alignment up to ⅛ in., and end-float up to 5/16 in.—contingent upon the size of the coupling and the duration of the conditions—or it will take all of these simultaneously.



Full view

Cutaway view

Heart of the Para-flex Coupling is a tire with synthetic tension members bonded together in rubber. The coupling consists of this flexible tire clamped between two hubs which are mounted on the shafts to be coupled. The flexible member is held between the flanges and clamp rings of the hubs. Both hubs of the coupling are machined to take Taper-Lock bushings.

Para-flex Couplings will be stocked by Dodge distributors in popular transmission sizes. They are available from factory stock in capacities up to 600 hp at 900 rpm.

Emergency Kit Repairs

CONTAINING PLASTIC STEEL for on-the-spot repairs of tanks, pipes, pumps, valves and other types of machinery, an Emergency Supply Kit is now available through industrial supply dealers, according to Devcon Corp., Endicott St., Danvers, Mass., the manufacturer.

Plastic Steel is a combination of 80 percent steel and 20 percent plastic. It is reportedly as easy to use as modeling clay, can be formed into any shape and will not run or sag when applied to a vertical surface. Two hours after the addition of a special hardening agent (supplied), according to the manufacturer, Plastic Steel becomes a strong, tough, rigid metallic piece. No heat or pressure is required. It is said to be durable, permanent and essentially non-shrinking or expanding.

Wagon Drill

LONG FEED TRAVEL, a new down-pressure motor and line oiler, and a full range of feed pressures are reported features of the Schramm DR-126-A Wagon Drill.

A standard Schramm four-in. drifter is eployed, with 10-ft feed travel for 8-ft steel changes.

Other improvements claimed include a double-cylinder, seven-blade air motor. This high torque motor runs evenly with 14 impulses per revolution. Supply air can be throttled for an infinite number of feed pressures. A two-gal capacity line oiler is arranged so that a motor for the U-bar, or any other equipment, can be lubricated. At the lower end of the air shell is a Schramm Centralizer, which reportedly prevents the drill from "walking" when a hole is started.

Additional information is available from Schramm, Inc., 900 East Virginia Ave., West Chester, Pa.

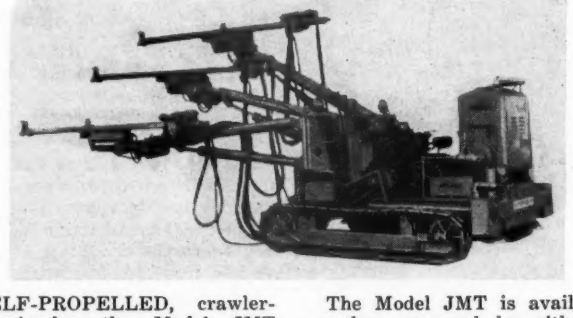
Radiotelephone

A PORTABLE AM radiotelephone developed to handle field communications in oil exploration, geological survey, mining, industrial communications, etc., has been announced by Kaar Engineering Corp., Box 1320, Palo Alto, Calif.

Designated the TR#246 Packset, this radiotelephone measures 12 by 6 by 11⅜ in. and weighs, including full complement of batteries, 23 lb. Power is obtained from three 1.5-v "A" batteries, three 4.5 "B" batteries, and two 7.5 "C" batteries. The Packset has built-in metering facilities, receiver noise limiter, squelch system, and a base loaded, telescoping 16-ft antenna.

Entirely self-contained in a watertight canvas backpack, the Packset reportedly can be operated and carried at the same time.

"Push-Button" Rock Drilling



A SELF-PROPELLED, crawler-mounted jumbo, the Model JMT Mobiljumbo (R), has been announced by the Gardner-Denver Co., Quincy, Ill. According to the company's engineers, this unit put rock drills under finger-tip control at the operator's position.

The Model JMT is available with crawlers powered by either diesel-hydraulic drive or by five-cylinder radial air motors. It is furnished with two or three creep-free hydraulic booms. Rock drills and feeds may be selected to suit the ground being worked.

— *Announcements* —

Adrien F. Busick, Jr., vice-president of engineering for **Marion Power Shovel Co.** has been named executive vice - president and general manager of that company. He will have complete charge of all functions and operations of the company's plants. A further announcement was made of the voluntary retirement of **David E. Rizor**, vice-president, large machine sales. He was succeeded by **Maurice V. Cornell.**

A. F. Busick

Howard B. Jones recently joined the **Long Co.** as sales representative for northern West Virginia and western and central Pennsylvania. Jones was formerly with National Mine Service Co.

Joy Mfg. Co. has announced the affiliation of **John P. Courtright** with the company as a consultant on metal mining, quarrying, strip mining, and construction problems. Courtright was formerly president of **Marion Power Shovel Company**, and has been associated for more than 30 years with the mining and quarrying industries in the United States and abroad.

American Cyanamid Co. has signed an agreement with the **Illinois Powder Mfg. Co.**, producer of industrial explosives, providing for the sale of Illinois Powder business and assets to Cyanamid.

Illinois Powder will become a part of the explosives department of Cyanamid's Organic Chemicals Division. Until now, American Cyanamid's powder sales have been largely confined to states east of the Mississippi River. Illinois Powder sales have been largely concentrated west of the Mississippi.

Byron A. Haney has been appointed Northwestern sales manager for **Bucyrus-Erie Co.** He takes over responsibility for the sales of all Bucyrus-Erie products in the states of Washington, Oregon, Idaho, and Montana, the Territory of Alaska, and the Yukon Territory.

Duane A. Houkom is now sales manager of **Atlas Copco Eastern, Inc.'s** Stationary Compressor Division.

Houkom joined Atlas Copco in 1953 and has been serving as southeastern district manager with headquarters in Knoxville, Tenn. He earlier was associated with **New Jersey Zinc Co.**

Flood City Brass & Electric Co., Johnstown, Pa., is expanding its manufacturing facilities by the erection of a new addition to the present plant.

To fill a vacancy left by the death of **Harold H. Holkestad** on April 23, **R. L. Scott**, has been appointed manager of mining supply sales for **The Colorado Fuel & Iron Corp.** Assistant manager of mining supply sales is **Howard C. Schmuck, Jr.**

Work has already begun on a new half million dollar research center at the main plant of **Rome Cable Corp.**, Rome, N. Y. Expected to be completed in November, the research center will feature a complete pilot plant so that experimental production runs can be made without interrupting the normal production activities within the plant. An outdoor area for "weather testing" cables will be included also.

Appointment of **Charles H. Eisenhardt** as eastern area manager of sales, **American Steel & Wire Division, United States Steel Corp.**, has been announced. In his new post, Eisenhardt will be in charge of all the Wire Division's sales activities in the New England area, as well as in the State of Virginia and the eastern portions of New York and Pennsylvania.

Timken Roller Bearing Co. recently elected **Dwight A. Bessmer** executive vice-president.

John E. Chadwick has been named vice-president and sales manager in charge of sales, service and sales promotion, for the **Koehring Division** of **Koehring Co.**

William L. Pringle, who has been serving as director of engineering with the **Long Mfg. Division of Borg Warner Corp.**, has been elected president of **Hercules Motor Corp.** He succeeds John C. Keplinger who is retiring.

CATALOGS & BULLETINS

LONGER V-BELT LIFE. *Allis-Chalmers Manufacturing Co., Milwaukee, Wis.* Simple precautions to prolong the life of V-belts and increase drive efficiency are contained in bulletin 20X6234C, "Longer Belt Life for Your V-Belt Drives." The brochure describes various types of V-belts, tells how to select and match them, and lists seven steps for the correct installation of belts. Portrayed are eight most common causes of V-belt destruction.

HOW COAL MINES ARE CUTTING COSTS. *Dept. 104C, The Gates Rubber Co., Sales Division, Inc., 999 So. Broadway, Denver 17, Colo.* A survey by field engineers of The Gates Rubber Co. shows how coal mines, washeries and processing plants are getting more profits from their present operations by cutting unnecessary labor and operating costs, and by reducing downtime. Industrial Survey DH-426 provides illustrated case histories that outline specific results obtained by owners and operators.

EXCAVATION CASE HISTORIES. *American Cyanamid Co., Explosives Dept., 30 Rockefeller Plaza, New York 20, N. Y.* This brochure entitled, "Stripping Case Histories," outlines current information on drilling, blasting and excavating methods used by the coal stripping industries. The bulletin unfolds into a two-page chart which present 46 stripping case studies in condensed data form. Case studies include information on geological formations, coal seam thickness, excavating practices, drilling equipment, bit performance, drill patterns, blasting data, and explosives ratios.

WATER SUCTION AND STEAM HOSES. *B. F. Goodrich Industrial Products Co., Akron, Ohio.* Two new catalog sections on its line of water suction and steam hose have been published by B. F. Goodrich. The water suction hose section provides operating data and specifications on five types of water suction hose for industrial use, and complete coupling data. The steam hose section explains operating and specification data on five types of steam hose. It also includes coupling information.

COAL PREPARATION. *Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill.* Book 2655, "Coal Preparation Plants and Equipment," features Link-Belt's most recently engineered coal preparation plants throughout the United States and incorporates the latest equipment manufactured for the coal industry. The section devoted to equipment includes unloading and handling facilities; cleaning, classifiying and conveying methods; crushing, blending, thermal drying; water clarification; loading and replacement units; with detailed descriptions of how each component fits into an up-to-date operation.

TRANSMISSION. *Fuller Manufacturing Co., Transmission Division, Kalamazoo, Mich.* A color cartoon style driver instruction booklet on the 7-speed R-35 Fuller RoadRanger Transmission, the publication gives tips on how to handle the single-stick 7-speed transmission under varying conditions of traffic and terrain. The transmission's shift pattern and shifting instructions are reproduced pictorially.

(*Continued on next page*)

(*Continued from previous page*)

MOTOR GRADER. *Allis-Chalmers Manufacturing Co., Construction Machinery Division, Milwaukee, Wis.* Working advantages provided by the Allis-Chalmers Model Forty Five Motor Grader are covered in this 16-page catalog (MS-1148). The illustrated catalog also tells about attachments and accessories that add to the versatility of the unit, and includes its specifications.

ROTARY DRILL. *Davey Compressor Co., Kent, Ohio.* Bulletins LL-5802 and M-733 describe the Davey Compressor Company's Model M-8TA tractor-mounted rotary drill. One is a single page leaflet, containing detailed specifications. The other, a four-page leaflet, describes both tractor and truck-mounted units with rated capacities to 2000 ft.

TORQUE CONVERTERS. *The National Supply Co., Two Gateway Center, Pittsburgh, Pa.* National torque converters for excavators, cranes and shovels, and their advantages in this heavy-duty service are presented in Data Sheet No. 101. Representative types and makes of engines with which the 17 sizes of National converters can be used in the 100 to 1000-hp range are also listed.

FABRICATION SERVICE. *Tornqvist Co., 521 Crooks Ave., Clifton, N. J.* Services being rendered to American industry by specialized custom fabrication is the subject of the brochure entitled, "Let Tornqvist Do It." Company facilities for working all types of metals are described.

BATTERY BUYING GUIDE. *Gould-National Batteries, Inc., Trenton, N. J.* "So Your're Going to Buy an Industrial Battery" is the title of this illustrated reference booklet (GGB-1788). Designed to help industrial battery buyers select the most economical and efficient battery for their operation, this pocket size booklet outlines the significance of battery design, and the contributions of research and development to lower operating costs, greater productivity and greater profits.

RECIPROCATING-PLATE FEEDERS. *McLanahan & Stone Corp., Hollidaysburg, Pa.* McLanahan Feeders are designed for feeding controlled quantities of all materials from sand to shovel-loaded rock and ore. Featured in Bulletin No. FRE-57 are data on performance and dimensions for the heavy-duty and light-duty feeders.

HISTORY OF TRUCKS. *Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.* Entitled "50 years of International Trucks, 1907-1957," this booklet traces the progress of truck manufacture from the first high-wheeled, 20 hp "IHC Auto Wagon" built in 1907 down to the present day International operation which offers a complete line of trucks. The brochure carries the form number CR-317-G.

INDUSTRIAL HOSE AND FITTINGS. *Aeroquip Corp., Jackson, Mich.* Catalog Bulletin No. 182 lists hose, fittings, socketless kits and self-sealing couplings. Prepared for use in ordering Aeroquip parts, it contains information on the company's standard industrial products and is designed primarily for use in the replacement field.

AIR TOOL TROUBLE CHART. *Sales Promotion Dept., Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.* Entitled, "I know airpower," Bulletin AT-116B explains troubles encountered, causes, and remedies when using rock drills. In addition to a rock drill "trouble-shooting chart," part of the eight-page bulletin is devoted to growing usage of air as power. Pictures and drawings are used to illustrate construction and maintenance of various air tools.

DECO EQUIPMENT. *Denver Equipment Co., P. O. Box 5268, Denver 17, Colo.* Bulletin No. G3-B60 shows the Denver Equipment Company's latest improved models in equipment for the chemical processing, mining and milling industries. The machines are pictured; and technical information concerning size, capacity, dimensions, and horsepower are given. Also described are the company's rubber covering service, laboratory testing service, laboratory equipment, and engineering and mill design service.

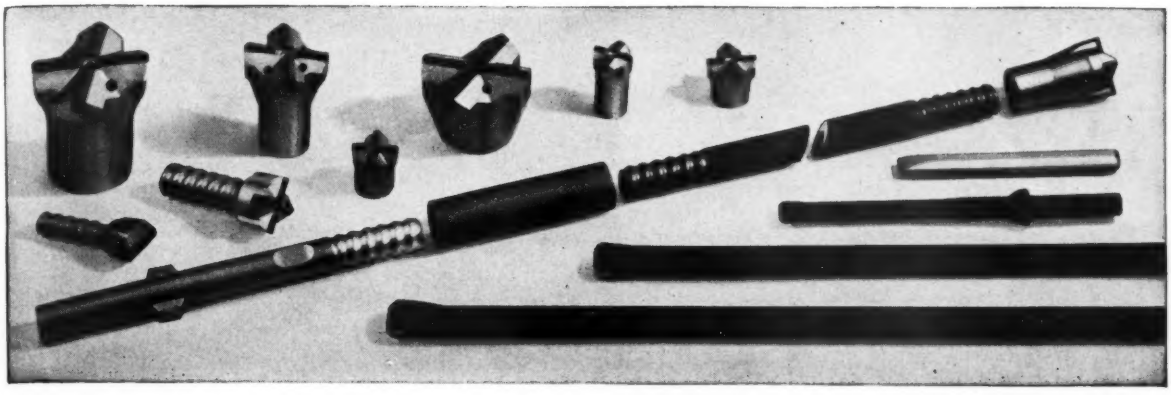
OIL FILTERS. *Caterpillar Tractor Co., Peoria, Ill.* Are all lubricating oil filter elements just about the same? Won't most any filter element trap impurities? And why use filters at all when additive oils are supposed to keep engine parts clean? Answers to these questions are found in Form DE732 entitled, "Have You Been Around When Your Engine's Torn Down?"

LOCOMOTIVE PARTS SERVICE. *General Electric Co., Schenectady 5, N. Y.* This 12-page illustrated bulletin, GEA-6534, outlines nine reasons why the General Electric Company's parts service can reduce railroad maintenance costs and increase operating efficiency.

MOTOR STARTERS AND CONTACTORS. *Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.* The company's complete line of motor starters and contractors in sizes 4, 5 and 6 (Type 425), 50 to 400 hp, is described in Bulletin 14B8615, entitled "Allis-Chalmers ac Motor Starters and Contactors."

MOTIVE POWER SURVEY. *General Electric Co., Schenectady 5, N. Y. Bulletin GEA-6516,* "How a General Electric Motive Power Survey Helps You Select the Right Locomotive for Your Specific Haulage Needs," illustrates how motive power survey helps customer buy correct industrial locomotive by following typical team step-by-step in actual survey.

Index to Advertisers



SANDVIK COROMANT—

A Complete Range of Drill Steel Equipment

You know as well as we do the advantages of buying all your drilling equipment from one supplier. These advantages become still more evident if you buy from the Sandvik Range. The Sandvik Steel Works are the world's largest manufacturers of tungsten carbide for rock drilling. Their production covers integral steels, detachable bits, extension steels and stone working tools—all made of high-quality Swedish alloy steel, all fitted with the well-known Coromant tungsten carbide inserts.

Integral steels with 50% longer life

Sandvik Coromant integral steels have up to 50% longer rod life than ordinary steels, thanks to anti-corrosion SR-treatment, which protects them during transport, storage and actual drilling. In addition, air-tight plastic caps give bit and shank extra protection during transport and storage. They are available in these standard sizes:—

$\frac{7}{8}$″ hollow hexagon	1′4″-13′1″
$\frac{7}{8}$″ hollow hexagon	1′4″-21′0″
1″ hollow hexagon	2′6″-21′0″
Flexible drill steels	2′7″-31′6″

Precision-made rock bits

The threads of Sandvik Coromant (cross and X-design) bits are precision milled. The bits are so accurately manufactured that not only smoother drilling but *longer life* are ensured. Standard bit diameter sizes range from $1\frac{1}{2}$″ to $4\frac{1}{2}$″. The 773 bits (bottoming type) are available with GD400 and GD600 thread, or with $1\frac{1}{4}$″, $1\frac{1}{2}$″ and 2″ rope thread. The 776 bits, for standard shoulder-type drill rods, are available with threads ranging from $\frac{7}{8}$″ to $1\frac{11}{16}$″.

Efficient extension steels

The rope-threaded joints of Sandvik Coromant extension steels are solid and make joining and unscrewing extremely easy. Sizes available: $\frac{7}{8}$″ and 1″ hexagon steels, $1\frac{1}{4}$″ and 2″ round steels. A special feature of the $1\frac{1}{4}$″ equipment is the $1\frac{1}{2}$″ flushing hole, about twice as large as most. This gives better cleaning of the bore hole and a higher rate of advance, reduces wear and risk of steels sticking. The 'cold rolling' technique makes this wider flushing hole possible *without any loss of strength.*

Wide variety of Stone Working Tools

A single plug hole steel made by Sandvik is capable of drilling up to 1000 holes, each about 3.9″. Sandvik Chisel Steels are made with rubber sleeves to reduce vibration and protect the worker. Sizes available: Plug Hole Drill Steels with bit diameters ranging from approx. $\frac{31}{32}$″ to $\frac{7}{8}$″. Chisel steels with bit diameters from approx. $\frac{5}{16}$″ to $\frac{25}{32}$″.

The World's foremost drilling unit

Sandvik Coromant extension and drill steels have been developed in close co-operation with Atlas Copco, manufacturers of rock drills and other compressed air equipment. The combination of Sandvik steels and Atlas Copco rock drills is the world's most widely used drilling unit—responsible for the drilling of more than one thousand million feet each year!

Write, phone or cable today for further details to any of the addresses below:

Atlas Copco

EASTERN *P.O. Box 2568 Paterson 25, N.J.* **PACIFIC** *930 Brittan Av, San Carlos, Calif.*

CANADA *Montreal Airport, Quebec.* **MEXICO** *Apartado Postal 56, Torreon, Coahuila.*

D5577A

Mechanization returns greater dividends with

Edison R-4 Cap Lamps on the job

Edison R-4 Electric Cap Lamps can help modern mining machines realize their *full* potential.

Reason why? Because more and better light is always on the job with the brilliant, unfailing beam of the Edison R-4. This dependable source of illumination permits the miner to perform his duties with utmost efficiency and safety. You don't have long to wait for results with the Edison R-4, either. They register quickly in terms of accident prevention and increased tonnage per man-shift.

Let us demonstrate the advantages of this *quality* cap lamp in your underground operation. Write or call us soon for more detailed information.

MSA
SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.
Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh